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HANSEN (H. P.). **Undersøgelser og Iagttagelser over Tobaksviroser i Danmark.** [Investigations and observations on Tobacco viroses in Denmark.]—*Tidsskr. Planteavl*, 1, 2, pp. 191–298, 17 figs., 1946. [English summary.]

The diseases observed in these comprehensive laboratory and field studies on tobacco viruses in Denmark [*R.A.M.*, xxv, p. 14] fell into three groups, characterized mainly by (A) mosaic symptoms, (B) severe foliar distortion, and (C) necrosis. Representative of (A) were ordinary tobacco mosaic (*Lycopersicum* virus 1 [a strain of tobacco mosaic virus], occasionally *Nicotiana* virus 1 [tobacco mosaic virus]), net mosaic or vein-clearing, usually caused either by *Solanum* virus 2 [potato virus Y] or *Cucumis* virus 1 [cucumber mosaic virus]; spot mosaic, also generally due to one or other or the foregoing but sometimes associated with *S.* virus 1 [potato virus X]; ring mosaic (potato virus X); and mottling of diverse origin, e.g., manganese deficiency, genetic constitution, and a disturbed water balance. (B) included band or thread-leaf (tobacco mosaic virus) and crinkle mosaic of two types, (*a*) irregular foliar crinkle and distortion, often accompanied by the dark green blisters of severe mosaic (tobacco mosaic virus), and (*b*) more or less irregularly crinkled leaves, often contracted just behind the tip, with mosaic of varying intensity, with pale patches mostly along the veins (cucumber mosaic virus). Group (C) comprised stripe and curl disease (*N.* virus 5) [? a strain of tobacco streak virus: ibid., xxv, p. 83]; vein and spot necrosis, sometimes associated with a combination of potato viruses X and Y or potato virus X and cucumber mosaic virus; labyrinthic necrosis (probably tobacco streak virus); large, circular masses of necrotic spots on the basal or medium leaves of plants affected by labyrinthic necrosis or in the same field, presumably another manifestation of the *N.* virus 5; ring necrosis (potato virus X); and necroses resulting from adverse environmental factors of various kinds or insect injuries.

The two most serious diseases were tobacco mosaic and the stripe-and-curl form of streak. The former was widespread in all tobacco-growing districts, its incidence in some cases ranging from 25 to 75 per cent. with a resultant loss in value of 50 per cent. The Burley variety appears to be more susceptible to the tobacco mosaic virus in the field than F.U., U., or Havana. Stripe-and-curl disease was very prevalent in Fünen and Jutland, causing up to 100 per cent. infection and material damage to the crops, the leaves of diseased plants being practically worthless. The virus thrives in soil [ibid., xxv, p. 83] with a high moisture content.

The other diseases listed above are in general of minor importance, though they may be locally severe. Those caused by potato virus Y are controllable by the selection of sites for tobacco plantations at a reasonable distance from potato fields. The writer has shown that the dissemination of this virus by aphids from potato to tobacco is governed by the same general rules as those applying to field transmission from potato to potato [ibid., xxv, p. 311]. Similar observations hold good for virus X.

Individual samples of the several viruses from infected plants were subjected to intensive analysis. None of those referred to potato virus Y caused malformation of inoculated tobacco plants. Some of the cucumber mosaic virus samples induced

in tobacco symptoms closely resembling those of potato virus Y, while others also caused foliar distortion.

Of the two viruses causing tobacco mosaic in Denmark *L.* virus 1 induces in tobacco a mosaic, usually with foliar necrosis, but severe distortion is scarcely ever present, whereas with *N.* virus 1 the mosaic, normally non-necrotic, is frequently associated with severe leaf malformation. One strain (4) of *L.* virus 1 caused systemic symptoms in *N. glutinosa.* In *Datura stramonium* both *N.* virus 1 and L. virus 1 induce a systemic, generally lethal disease, with mostly unilateral stem and petiole necrosis. Tomatoes may respond to inoculation with the usual symptoms. The two agents of the tobacco mosaic were shown to be serologically related but not identical. In immunological tests *L.* virus 1 conferred little or no protection against subsequent infection by *N.* virus 1.

Besides these two main types, this group comprised some forms inducing very mild symptoms or none on tobacco. Of these No. 78_2 was latent in tobacco plants except for faint primary symptoms, vein-clearing, and initial slight mottling. The inoculation of *N. glutinosa* with juice from apparently healthy tobacco plants harbouring No. 78_2 resulted in primary local lesions of the ordinary type, while *D. stramonium* succumbed to lethal necrosis as usual. Infection by the masked virus No. 78_2 immunized tobacco plants against subsequent invasion by both the main forms of the tobacco mosaic virus.

All samples of stripe-and-curl-diseased tobacco plants contained the streak virus, with the addition in one only (No. 56) of potato virus X. The symptoms in greenhouse-inoculated plants were different from the usual field type, foliar crinkle being considerably less prominent or quite absent in older plants. Four days to a week after inoculation, the leaves presented a more or less curled appearance and bore necrotic, water-soaked, later desiccated, irregularly concentric lesions along and between the veins. Systemic necroses often developed in the primary leaf veins and petioles two to three weeks after infection, sometimes accompanied by necrotic streaks in the stem which, on the other hand, might not appear for one to two months or were altogether lacking. In many plants stem necrosis was the sole feature of the disease, while in others some of the leaves or a single shoot only were affected, and instances were also observed of the passage of the virus in a latent state through individuals showing no symptoms. True mosaic mottling was never induced by the streak virus, but zonate patterns of almost white lines occasionally developed on one or another leaf. In *N. glutinosa* the symptoms were essentially similar to those of tobacco, but systemic infection was less frequent. *D. stramonium* reacted positively only on the addition of carborundum powder to the inoculum, when dirty yellow blotches and irregular necroses appeared on the foliage after 12 days: in some cases the disease assumed a systemic form in the leaf veins, petioles, and stems, killing the plants within a month of inoculation. No symptoms developed in Up-to-Date potatoes after juice or grafting inoculations, but the young leaves of several shoots of a King Edward plant acting as a stock for a streak-diseased tobacco scion bore a few dark brown, necrotic spots. Juice from the infected leaves, mixed with carborundum, was inoculated into tobacco plants, which within six days developed typical streak symptoms. Contrary to Böning's observations [ibid., x, p. 563], therefore, the tobacco streak virus is definitely capable of infecting potato. The juice of streak-diseased plants was infectious at a dilution of 1 in 100 but not at 1 in 1,000, and after ten minutes' heating at 70° (but not 75°) or 40 days at 15°.

Infection of healthy tobacco plants was obtained with only one sample (No. 9) of the labyrinthic necrosis virus, the admixture of carborundum being necessary to secure proper results. This No. 9 sample is considered to be identical with that of tobacco streak. Ring mosaic, without doubt caused by potato virus X, was detected in a number of fields.

The properties of all the samples isolated are fully summarized in tables and a bibliography of 93 titles is appended.

HICKMAN (C. J.). **Infection of outdoor Tomato crops by Didymella lycopersici.**—*J. Pomol.*, xxii, 1–2, pp. 69–75, 1946.

In the Evesham area from 1941 to 1945 stem and fruit rot of tomato (*Didymella lycopersici*) appeared usually during July. Estimates of percentage losses for the years 1941–4 are given. The possibility that the disease might have its origin in the propagating soil or be seed-borne was experimentally examined. From locally grown seed, such as is widely used by Evesham growers, three groups of pycnidial fungi were isolated, of which one was determined as morphologically and pathogenically identical with cultures of *D. lycopersici*. The relation of seed infection to outbreaks of disease was studied in 1944, when plants were propagated in sterilized soil, one lot of which, (A), was grown from healthy seed mixed with 2 per cent. of seed showing 70 per cent. infection saved from diseased fruits, and the other, (B), from the infected seed only. No signs of *D. lycopersici* were seen during the period of germination. On 1st June 250 plants of each series were field-planted on land not previously cultivated with tomatoes. Following an unusually early appearance of stem rot, a few wilting plants were collected on 14th June. From 21st June to 24th August 63 severely wilted plants were removed from plot A and 85 from B, infection by *D. lycopersici* being confirmed for every plant. The conclusion is drawn that a small number of infected seeds in a sample may have epiphytotic effects where conditions favour the activity of the pathogen.

In experiments in 1943 and 1944 six growers co-operated to raise 100 plants each from the same healthy seed stock under their own conditions of cultivation, which ranged from excellent to bad, the plants being then transferred to land which had not previously borne tomatoes. It was found that no stem rot occurred on plants raised under good cultural conditions in nurseries with no previous record of the disease. Infection occurred in the field among plants raised under poor hygienic conditions in nurseries where the disease had been previously experienced.

In 1943 plants raised in pots of soil from a field that had carried successive heavily infected crops showed no trace of infection in the seedling stage and only infected plants later. In 1944 healthy plants were set out in seven fields that had previously borne diseased crops, but the disease appeared in appreciable amount only in one field, and even then more than half the infections did not develop until late.

These experiments showed clearly that an adequate rotation and healthy propagation will substantially reduce the possibility of early and serious outbreaks of *D. lycopersici* originating in the field.

Whether the fungus survives as mycelium or by pycnidia or, as considered possible by the author, by perithecial spores [*R.A.M.*, xxiv, p. 78], and whether the spores overwinter in cracks on canes, as suggested by Kordes [ibid., xii, p. 663], are questions which have finally to be determined. However, the danger which may arise from contaminated canes was exemplified in one experiment in 1945, when 38 out of 50 plants staked with suspected canes became infected, whereas two similar sets of plants staked with disinfected and new canes showed no infection.

Province of Nova Scotia, Report of the Department of Lands and Forests, 1945.—118 pp., 1 graph, 4 maps, Halifax, N.S., King's Printer, 1946.

The following information of phytopathological interest is presented on pp. 39–47 of this report [cf. *R.A.M.*, xxv, p. 51]. Die-back of yellow birch made rapid progress during the period under review, the most advanced stage of infection being in the Chignecto region of Cumberland County, where most of the trees have been

dead for several years. Data obtained in ground cruises at 24 points in the Province reveal complete mortality in 10 to 15 per cent. of the standing birch (4 in. and upwards in diameter), and 25 per cent. is over half dead. In merchantable-size plantations (8 in. and upwards in diameter) the corresponding figures are 20 and 40 per cent., respectively.

Moist chamber cultures and plate inoculations with material isolated from diseased trees yielded *Dermatea molliuscula* in its imperfect state, *Gelatinosporium fulvum*, *G. betulinum*, *G. magnum*, a *Phomopsis* agreeing with the conidial state of *Diaporthe eres* (apparently identical with the European *D. perniciosa*) [ibid., xiii, p. 270], and two species of *Cryptosporiopsis*, possibly representing the conidial states of *Ocellaria ocellata* and *Pezicula betulae*. The results of inoculations to date denote that well-watered healthy seedlings with strong, uninjured root systems will overcome infection by these organisms.

An investigation of the exposed root systems of five trees in a severely diseased stand in Picton County revealed the presence of rhizomorphs of *Armillaria mellea* in all cases and that of mycelial forms of the fungus in one: rootlet mortality ranged from 29·2 to 100 per cent.

Miller (P. W.). **Current investigations on the control of Walnut blight and Filbert blight by dusting.**—*Rep. Ore. St. hort. Soc.*, [*1945*], pp. 84–85, [? 1946].

In dusting trials against walnut blight [*Xanthomonas juglandis*: *R.A.M.*, xxiii, p. 416; xxv, p. 192] in Oregon in 1945 on Franquette walnuts, copper+lime+sulphur+oil (20—40—10—2), copper hydroxide+sulphur+oil (30—15—2), copper+lime+sulphur (20—40—10), and zinc coposil+sulphur+oil (25—15—2) dusts applied four times at approximately weekly intervals from the early pre-bloom stage reduced infection from 25·4 per cent. in the controls to 2·2, 5·2, 5·4, and 6·5 per cent., respectively. Under the same conditions, Bordeaux mixture (4—2—100) applied in the early and late pre-bloom and early post-bloom stages reduced infection to 2·4 per cent. In a different locality, four weekly applications of a copper+lime+sulphur (20—40—10) dust from early pre-bloom reduced infection from 41 to 2·1 per cent.

For general use a dust composed of 20 per cent. monohydrated copper sulphate, 40 per cent. hydrated lime, 10 per cent. dusting sulphur, 18 per cent. talc, 10 per cent. diatomaceous earth, and 2 per cent. light, highly sulphonated oil is recommended. If filberts [*Corylus avellana*] are planted among the walnuts to be treated, the sulphur should be omitted. In an average west Oregon season, four dust applications should be made at intervals of not over seven days from the early pre-bloom stage. In a very wet season, six applications at intervals of a week may be required.

One year's tests indicated that a copper dust will materially reduce bud and twig blight [*Phytomonas corylina*], one application, for example, of a yellow cuprous oxide+lead arsenate (10—40) dust applied in the middle of July, 1944, reducing it from 3·3 to 0·06 per cent. Further work is necessary; meanwhile a dust composed of 25 per cent. monohydrated copper sulphate+33 per cent. lime+40 per cent. lead arsenate+2 per cent. light, highly sulphonated mineral oil, or, alternatively, one composed of 10 per cent. yellow cuprous oxide+40 per cent. lead arsenate+10 per cent. diatomaceous earth+38 per cent. talc+2 per cent. light mineral oil is recommended for trial.

Bitancourt (A. A.) & Rossetti (Victoria). **As galhas pulverulentas das Lauraceas.** [The powdery galls of the Lauraceae.]—*Biológico*, xii, 3, pp. 55–62, 3 pl., 1946. [English summary.]

Trees of the genera *Nectandra*, *Ocotea*, *Cryptocarya*, and other members of the Lauraceae in neotropical forests are often affected in the spring and summer by

galls attributed by different authors to fungi of various groups, of which the Basidiomycetes appear to be the most appropriate for their accommodation on morphological grounds. The following species have been observed in São Paulo, Brazil, since 1931: *Drepanoconis larviformis* Speg., the agent of chalk-white, powdery galls on the young shoots, stems, leaves, and pistils or young fruits of *N. puberula*, *N. tweediei*, *N. nitidula*, *N.* sp., and (?) *C. mandiocana*; *Clinocodium farinosum* (Henn.) Pat., producing dark brown, powdery excrescences on *N. tweediei* and *N.* sp., and *C.* sp., causing a verrucose foliar gall of *N.* sp.; *Botryoconis saccardoi* H. & P. Syd., forming brown, powdery galls on the stems of an undetermined host; *B. pallida* H. & P. Syd., responsible for the development of whitish, powdery galls on *O. pulchella* fruits; and a hitherto undescribed species producing yellowish, powdery galls on the stems of an unnamed host.

Neilson-Jones (W.). **Further field observations on fused needle disease of Pines.**—*Emp. For. J.*, xxiv, 2, pp. 235–239, 2 figs., 1945.

The results of the experiments in the Wareham forest [*R.A.M.*, xxi, p. 312] on fused needle disease of pines, continued for a further five years, proved the value of a compost C5, derived from spent hops (phosphorus pentoxide content 2·8 per cent.), alone or in combination with basic slag in preventing the incidence of the disease in and promoting recovery of diseased *Pinus contorta* trees, more than half the trees recovering in five years, whereas in the healthy untreated controls 24 per cent. became affected. While in this test C5 was effective, another compost C1, derived from straw (phosphorus pentoxide content 0·77 per cent.), was not, and it became clear that successful use of composts was dependent on the phosphate level not being a limiting factor, although basic slag alone gave only a transitory improvement. The cost of the above combined treatment is, however, sufficiently high to suggest discarding planting of *P. contorta* and other susceptible species in areas where climatic and edaphic conditions favour the development of the disease.

A photograph is appended of a 12-year-old Scots Pine (*P. sylvestris*) which developed severe symptoms during the 1944–5 season, although this species is generally resistant to fused needle disease in this country.

Rennerfelt (E.). **Om vår nuvarande kunskap om törskatesvampen (Peridermium) och sättet för dess spridning och tillväxt.** [On our present knowledge of the 'resin top' fungus (*Peridermium*) and its mode of dissemination and growth.]—*Svenska Skogsvårdsfören. Tidskr.*, xli, 4, pp. 305–324, 7 figs., 1 map, 1943. [German summary. Received April, 1946.]

Scots pines (*Pinus sylvestris*) in Sweden harbour two blister rusts, the autoecious *Peridermium pini*, and the heteroecious *Cronartium asclepiadeum* (*P. cornui*) [*R.A.M.*, xviii, p. 73] with the teleutospore stage on *Cynanchium vincetoxicum*, *Paeonia* spp., and other plants of minor importance. Most of the inoculations performed in 1942–3 with blister rust collections from the south and south-east of the country gave positive results on *C. vincetoxicum*, indicating that *Cronartium asclepiadeum* predominates in these regions, whereas none of the northern collections infected the alternate host, denoting their identity with *P. pini*. Only one of the numerous experiments on pine was successful.

The rust appears to gain ingress to the trees mainly through the stomata of the needles. Aecidia develop two to three years later and the mycelium proceeds through the branches to the stem. Sections through 11 diseased stems yielded information concerning the age of the wounds and of the pines at the time of infection. the former ranging from 8 to 31 and the latter from 65 to 96 years.

RENNERFELT (E.). **Om Granens rotröta, dess förekomst och utbredning.** [The occurrence and distribution of Spruce butt rot.]—*Svenska Skogvårdsfören. Tidskr.*, xliii, 4, pp. 316–334, 4 figs., 2 diags., 1 map, 1945. [English summary.]

Fomes annosus is the most destructive of the fungi concerned in the etiology of butt rot of spruce [*R.A.M.*, xxv, p. 193] in Swedish forests, where the disease is responsible for annual heavy losses and requires intensive study from the silvicultural, edaphic, and mycological angles.

The fungus occurs principally as a saprophyte on spruces approaching the felling age, the dead roots on the under side of the stubs probably constituting the main channels of ingress, but on sandy soils in some districts, e.g., Scania, Blekinge, and Halland, it assumes a parasitic form both on spruce and pine in the younger age-groups. *F. annosus* has very rarely been observed on larch.

The geographical distribution of the pathogen was studied by means of malt agar cultures from increment cores obtained by sterile drilling. It was found to be widespread in the southern and central regions and over extensive areas in the north, exclusive of the granite rock formations in the last-named. The incidence of the disease was investigated by the drilling of all spruces over 10 cm. in diameter at breast height on small experimental plots. In severe cases 50 to 80 per cent. of the trunks might be involved, especially on previously cultivated sites or soils with a high lime content, though heavy damage was also recorded on sandy and moraine soils. Spruce stands succeeding beech or mixed with other trees were generally comparatively healthy.

There is no immediate prospect of a direct campaign against the butt rot caused by *F. annosus*. Where the damage warrants such a measure, spruce should be replaced by broad-leaved trees, such as oak, beech, and birch, which are very seldom attacked, or resistant conifers, e.g., larch, European silver fir [*Abies alba*], and (generally) Scots pine [*Pinus sylvestris*].

TRESCHOW (C.). **Undersøgelser over Brintjonkoncentrationens Indflydelse paa Vaeksten af Svampen Polyporus annosus.** [Studies on the influence of the hydrogen-ion concentration on the growth of the fungus *Polyporus annosus*.] —*Forstl. Forsøgsv. Danm.*, xv, pp. 17–32, 1 fig., 1943. [German summary. Received July, 1946.]

Following up previous studies by Swedish and Danish workers, the author found that the influence of the hydrogen-ion concentration on the growth of *Polyporus* [*Fomes*] *annosus* isolated from spruce [see preceding and next abstracts] depends on the nature of the substratum [*R.A.M.*, xii, p. 543]. Thus, in a liquid medium, 3 per cent. malt extract, growth reached a peak at P_H 4 to 4·4 and no development took place at above P_H 6 or below P_H 3. However, on filter paper in the same medium, i.e., under conditions simulating those afforded by a solid substratum, there was no variation in the growth of the fungus within a range of P_H 3 to 7. In tests with sterilized forest humus equally profuse growth was made on the acid litter of spruces (P_H 4·3) and beech mould (P_H 6·3), but the fungus was unable to develop in pure mineral soils. When the hydrogen-ion concentration of sterile forest humus was varied by the admixture of lime in amounts ranging from 2 to 20 gm. per 50 gm. soil no difference in the growth of the fungus was detected in the several flasks.

WAGENER (W. W.) & CAVE (M. S.). **Pine killing by the root fungus, Fomes annosus, in California.**—*J. For.*, xliv, 1, pp. 47–54, 2 figs., 1946.

Fomes annosus has been found to be a primary agent of mortality among Jeffrey and ponderosa pines (*Pinus jeffreyi* and *P. ponderosa*) of all ages in the easterly section of the California pine region, where sugar and Coulter pines (*P. lambertiana*

and *P. coulteri*) may also be killed. A re-examination of the cultures isolated by Olson from trees in the Lassen National Forest and described by him as a new species, *Cunninghamella meineckella* [*R.A.M.*, xxi, p. 233], confirmed the suspected identity of the latter with *F. annosus*, which was again observed in 1941 in the Cleveland National Forest causing heavy loss, in conjunction with *Armillaria mellea*, in *P. jeffreyi* stands. The fungus, a source of serious damage to conifers in Europe [see preceding abstracts], has not hitherto been regarded as a major pathogen in the United States. Recent evidence indicates that it is also much more prevalent than formerly supposed on white and Californian red firs (*Abies concolor* and *A. magnifica*), causing butt and root rot.

Infection spreads from an initial focus, such as a stump or snag, to surrounding trees through contact between overlapping root systems, forming a roughly circular opening in stands on level ground. The disease is almost wholly confined to light sandy soils (P_H 5·7 to 6·7) in the drier areas of the pine belt. Destruction by *F. annosus* does not extend far above ground-level. Trees enfeebled by the root rot are commonly invaded by bark beetles and then resemble those killed by the primary action of these pests. Heavy infiltrations of resin are characteristic of roots initially attacked by the fungus, which rarely produces sporophores on infected pines. After the death of the trees the organism persists in the roots and butt as an agent of decay.

White Pine blister rust control in California and Oregon.—*J. For.*, xliii, 11, p. 831, 1945.

In this summary of an 18-page mimeographed report with the same title issued in January, 1945, the progress of white pine blister rust [*Cronartium ribicola*] in western North America since its introduction is briefly traced [*R.A.M.*, xxiii, p. 122]. The rust has advanced steadily southwards and is now established in Washington, Oregon, and California, the southernmost known infected areas of the sugar pine [*Pinus lambertiana*] forests in the last-named State being in the Eldorado National Forest, some 240 miles south of the Oregon line, where the disease was observed on currants and gooseberries in 1944 [ibid., xxiv, p. 296]. Within the borders of California and Oregon falls the entire range of the very valuable sugar pine, 2,500,000 acres of which have been included in the blister rust control zone.

Hansbrough (J. R.). **The significance of black line stain in Yellow Birch propeller lumber.**—*Spec. Release Dir. For. Path. U.S. Dep. Agric.* 23, 4 pp., 1945. [Mimeographed.]

During the past few years, yellow birch [*Betula lutea*] used for aeroplane propellers in the United States has shown the presence of a stain localized in the vessels and producing narrow, black, roughly parallel lines [cf. *R.A.M.*, xxiv, p. 346]. The condition is commonest in boards exposed to the weather during air-seasoning, and is primarily a sapwood stain, though occasionally found in the heartwood. Microscopic examination showed that the stain is due to one or more (so far unidentified) fungi that penetrate the vessels and grow extensively in them, but seldom pass into the other wood elements, and produce narrow, hair-like, black or bluish-black streaks. The colour is imparted by the mycelium and does not result from staining of the wood. The prevalence of the stain appears to be due to unsatisfactory transit and storage conditions.

Experimental evidence demonstrated that the difference in toughness and specific gravity between affected and normal wood was insignificant. Dipping in dowicide H or G (6 or 7 lb. per 100 gals.), santobrite (7 lb. per 100 gals.), permatox 10S (10 lb. per 100 gals.), or lignasan (2 lb. per 100 gals.) within 24 hours of sawing should give adequate control.

Jacquiot (C.). **Contrôle de l'efficacité des fongicides utilisés pour l'imprégnation des bois. Étude critique de la technique standard anglaise et de la norme allemande DIN DVM 2176. Principes pour l'établissement d'une norme française.** [Examination of the efficacy of the fungicides utilized for timber preservation. Critical study of the English standard technique and of the German standard DIN DVM 2176. Principles for the establishment of a French standard.]—*Ann. Éc. Eaux For. Nancy*, viii, 2, pp. 187–206, 1942. [Received April, 1946.]

With a view to the establishment of a standard French technique for the testing of timber preservatives, the writer made a comparative study of the official English [*R.A.M.*, xviii, p. 829] and German methods [ibid., xxi, p. 277] for determining the relative efficacy of these products [see next abstract]. Both procedures are open to a number of criticisms both in principle and in the details of their application, and in the proposed French standard [cf. ibid., xvi, p. 291] it is hoped to avoid these drawbacks. The fungi to be included in the tests should comprise, on the one hand, such ubiquitous and refractory species as *Coriolus* [*Polystictus*] *versicolor* and *Coniophora cerebella* [*C. puteana*], and on the other the particular organisms against which protection is sought, e.g., for pine posts, *Lenzites abietina* and *Xanthocrous* [*Fomes*] *pini*; for pine frame-work and joinery, *Gyrophana* [*Merulius*] *lacrymans*; for oak posts, sleepers, frame-work, and joinery, *L. quercina*; and for beech sleepers, *L. degener* Kalchbr. The final determinations should be based on tests of the inhibitory and toxic properties of the various preservatives, as well as of the resistance of the treated wood to a series of leachings. In preliminary tests of nitrophenols, a pyroligneous extract, and complex products such as injectauzol with a realgar base, only the first-named gave any promise as possible substitutes for creosote, and they were about twice as effective against *L. degener* as against *P. versicolor* (the only two fungi used).

Lutz (L.). **La méthode 'wood-block' pour la détermination du pouvoir toxique des antiseptiques utilisés pour la préservation des bois d'œuvre. Ses incertitudes.** [The 'wood-block' method for the toximetric determination of the antiseptics utilized for timber preservation. Its uncertainties.]—*Rev. int. Bois*, xiii, 103, pp. 1–2, 1946.

The writer's objections to the German wood-block method for the toximetric determination of timber preservatives are expounded, based on its inadequacy and unreliability, and a further plea made for international co-operation in the development of a standard technique for this purpose [see preceding abstract].

Rischen (H. W. L.). **Aperçu des antiseptiques pour la préservation des bois utilisés dans les différents pays européens avant et pendant la guerre.** [A glance at the antiseptics for wood preservation utilized in the different European countries before and during the war.]—*Rev. int. Bois*, xiii, 103, pp. 3–8, 1946.

Before the war of 1939–45, creosote was the most widely used preservative in European countries for the treatment of railway sleepers, telegraph poles, etc., but during the period of hostilities substitutes were largely used. A questionnaire on the subject of these changes addressed by the International Office of Studies on Wood Preservation to the railway and postal authorities in 12 countries elicited 13 replies containing information on the practices adopted, a summary of which is given in this report.

Moore (G. E.). **Soil as a culture medium for toximetric tests of wood preservatives.** —*Mimeogr. For. Prod. Lab. Can.* 102, 3 pp., 1944. [Received June, 1946.]

A detailed description is given of the method of using soil as a culture medium in toximetric tests of wood preservatives [*R.A.M.*, xix, p. 127]. To 300 gm. oven-

dry soil in a 16-oz. straight-sided jar with a screw cap distilled water is added to bring the water content up to 25 per cent. of the dry weight of the soil. Soil and water are stirred. If non-volatile preservatives are being tested, treated test blocks of known oven-dry weight may now be placed in the soil, otherwise this is done after the soil has been sterilized and cooled. The jars of soil, with or without the blocks, are next sterilized in an autoclave and after removal, the loose caps are screwed on tightly. If the test blocks are already in the soil, each jar is inoculated, when cool, with a standard culture of a wood-destroying fungus, the inoculum being placed on a slightly emergent corner of the block or on the soil close to it, and incubated at 81° F. Four months later, the blocks are removed, oven-dried, and weighed. Parallel control tests are carried out on untreated blocks.

COLLEARY (M. J.). **Treated and untreated timbers : completed service tests to date and notes regarding tests in progress.**—*Mimeogr. For. Prod. Lab. Can.* 105, 29 pp., 1945.

This report presents in tabular form the average life of timber components and structural units of several species of Canadian woods, untreated, and submitted to various treatments compiled from 157 service records so far completed in the Forest Products Laboratories of the Dominion Forest Service, Canada. Details of these tests are shown individually by Provinces in another table, which gives the salient facts of the full service life of each separate group of timbers removed from service. The present collection of service records is very incomplete and further tests require to be inaugurated.

CHRISTENSEN (G. N.). **Notes on a method for the study of diffusion of salts through green timber.**—*J. Coun. sci. industr. Res. Aust.*, xviii, 4, pp. 407–411, 3 figs., 1945.

As many Australian commercial timbers are refractory to penetration of preservatives by pressure, the method of penetration of green wood by diffusion is often used. The usual way of securing quantitative estimation of penetration has been to treat blocks of wood with solutions for given periods, then sectioning and analysing the samples. To obviate the disadvantages of this practice, a technique has now been devised to study diffusion through a wooden disk interposed as a 'membrane' in a diffusion cell.

Two glass bottles $2 \times 2 \times 2\frac{1}{2}$ in., of about 110 ml. capacity each, have one vertical face ground out, so that when the two openings are placed together the bottles form the two compartments of the diffusion cell. The specimen 'membrane' or disk is the same shape as the aperture, but larger. It is held in place by two rubber gaskets, the whole cell being held firmly by screw clamps and metal plates insulated from the glass by rubber pads.

The disk is coated round the periphery and for a $\frac{1}{4}$-in. margin round both faces with a double application of lacquer to make it watertight. The ground-glass faces of the cell are smeared with petroleum jelly. Both compartments should be filled with 100 ml. distilled water, and left for 24 hours at the temperature of the experiment to leach the water-soluble constituents in the disk. For the test one compartment is filled with distilled water and the other with a solution of the treating salt, both at the appropriate temperature. Both compartments are stoppered, and a short, open capillary is inserted in each stopper. Every 24 hours or so, the distilled water is removed for analysis. The compartment is refilled with 100 ml. distilled water at the required temperature and left undisturbed for a further period. For very accurate work, some form of agitation of the solutions is necessary, e.g., a rocking or rotating tray. It is also desirable to correct the concentration of the salt solution periodically.

Berry (A. G. V.) & Cater (J. C.). **Interim report on trials of copper naphthenates and mercuric naphthenates as wood preservatives.**—*Emp. For. J.*, xxiv, 2, pp. 233–235, 1945.

This report describes the condition of wood specimens three to six years after being given treatments previously described (*Emp. For. J.*, xx, 2, pp. 179–80, 1941). Applications of copper and mercuric naphthenates dissolved in gas oil gave protection to laylay trees [*Cordia lockhartii*] for 2½ years, after which they were destroyed by fungal attack. Only one portion (out of ten in each case) of white pine [*Pinus strobus*] treated with the lowest concentration of each preservative showed signs of fungal decay after six years. Highly satisfactory results against termites were recorded after treatment of white pine wood with the above preservative and with gas oil alone, and the experiments are being continued with a view to determining the full range of efficacy of this variable, but inexpensive petroleum product.

Preservative treatment of fencing posts.—*N.Z. J. Agric.*, lxxii, 2, pp. 193–196, 2 figs., 1946.

This contribution by the New Zealand State Forest Service offers advice based on the latest practice on the preservative treatment of fencing posts. A table of prescribed exposure to hot- and cold-creosote bath treatments for a number of locally used species is appended.

Neergaard (P.). **Frøspiring, frøbaarne Sygdomme, Frøafsvampning. Et Overblik over de Problemer, der for Gartneren knytter sig til Frøformering.** [Seed germination, seed-borne diseases, seed disinfection. A survey of the gardener's problems in connexion with seed production.]—Reprinted from *Frø og Gartneri, 1941*, 6, 12 pp., 1 fig., 2 graphs, 1941. [Received June, 1946.]

This is a useful summary of some important contemporary investigations on various aspects of commercial seed production, including the factors influencing germination and the temperature, water, oxygen, and (in some cases) light requirements of the seed; five important seed-borne diseases of horticultural plants in Denmark [cf. *R.A.M.*, xiii, p. 740], viz., *Ascochyta pisi* on peas, *Colletotrichum lindemuthianum* on beans [*Phaseolus vulgaris*], *Septoria apiicola* [*S. apii*], and *S. apii-graveolentis* on celery, *Stemphylium radicinum* [*Alternaria radicina*] on carrot, and *A. brassicae* and *A. circinans* [*A. oleracea*] on cabbage; and a discussion of the factors influencing (*a*) the *dosis toxica*, and (*b*) the *dosis curativa* of seed disinfectants.

Neergaard (P.). **Lysbehandlingens Inflydelse paa Levetiden hos Frø og Svampesporer.** [The influence of light treatment on the longevity of seed and fungus spores.]—*Gartnertidende, 1941*, 28, 4 pp., 3 figs., 1 graph, 1941. [Received June, 1946.]

In 1933, as part of an investigation on the influence of light on the longevity of seed and fungus spores, seeds from each of ten lots (five white cabbage and five cauliflower) of the previous year's harvest were (1) left untreated and preserved in a cork-stoppered glass container, (2) as (1) with a paraffined cork, (3) exposed for one hour to simultaneous radiation by a mercury-quartz and a Hanau Sollux lamp and preserved in a cork-stoppered glass vesssel. (4) as (3) with a paraffined cork, and (5) untreated, preserved in a leather bag. The incidence of cauliflower seed contamination by *Alternaria circinans* [*A. oleracea*] at the first examination in April, 1937, ranged from 0·0 per cent. for treatment (2) to 7·8 per cent. for (3), the corresponding figures for cabbage being from 5 per cent. for treatment (5) to 11 per cent. for (3). A year later, the cauliflower seeds exposed to treatments (1) and (2) were free from infection, while those subjected to (4) showed 7 per cent. (the same as in 1937); in the case of cabbage, the incidence of *A. oleracea* ranged

from 0·7 per cent. for (1) and (5) to 12·7 per cent. for (4). In January, 1941, when 800 seeds of each sample were sown on agar in Petri dishes, all those of cauliflower were healthy, whereas cabbage exposed to treatments (3) and (4) showed 5·6 and 3·4 per cent. infection, respectively; a month later the incidence had fallen to 1·5 and 1·8 per cent., respectively.

It is evident from these data that irradiation exerted a stimulatory effect on *A. oleracea*, especially in white cabbage, in which it persisted for a period of more than 8½ years. The question then arose whether this incentive to growth was a direct or an indirect result of the treatment, which might, for example, have altered the structure of the seed in such a way as to provide specially favourable conditions for the resting mycelium below the seed coat. In March to April, 1941, therefore, some 500 cabbage seeds of lots (1) to (4) were thoroughly rinsed in sterile water and the resultant spore suspensions passed through sterile filter paper, which was then cut into fragments and placed on malt extract agar in Petri dishes. Both the irradiated and untreated samples left thousands of spores on the filter paper, but colonies of *A. oleracea* developed only from the former, thereby demonstrating the directly beneficial action of light on the pathogen.

McLaughlin (J. H.). **Vegetable seed treatment for Oklahoma.**—*Bull. Okla. agric. Exp. Sta.* B-293, 24 pp., 1946.

The results of experiments conducted at the Oklahoma Agricultural Experiment Station, partly in connexion with the national seed treatment testing programme under the auspices of the American Phytopathological Society, and confirmed by results obtained elsewhere, show that the following chemical dusts may be most usefully employed for protecting vegetable crops against pre- and post-emergence damping-off (caused in Oklahoma chiefly by *Pythium debaryanum* and *Rhizoctonia* [*Corticium*] *solani*) in concentrations related to weight of seed: arasan (used for the first time as a vegetable seed treatment and possibly suitable for all the vegetables mentioned although not yet tested) or spergon for carrot (which should not be overdosed), cantaloupe, cucumber, okra [*Hibiscus esculentus*], and spinach at 0·5 per cent., lettuce 1, lima beans [*Phaseolus lunatus*] and watermelon 0·25, peas and edible soy-beans 0·2, and sweet corn [maize] at 0·17; spergon or vasco 4 for cabbage, turnip, eggplant, and salsify at 0·5 (the last-named can also be treated with cuprocide at the same concentration); arasan at 0·5 per cent. on beets (particularly susceptible to damping off) as beet and Swiss chard seed are unsuitable for treatment with spergon; spergon for radish and chilli pepper at 0·5 (alternative for chilli, cuprocide at the same dosage) and cuprocide for tomato at 0·5.

Methods of liquid treatment are recommended for potatoes (*Circ. Okla. agric. Exp. Sta.* 36).

Semesan, to be used according to the maker's directions, is suggested for cabbage, eggplant, chilli, tomato, and turnip.

The following percentage stand increases were obtained using seed treated with the chemicals recommended at or near the percentages given, the trials being conducted in the field except where otherwise stated; beet 128, cabbage (greenhouse) 34, cantaloupe 53, carrot 60, cucumber 162, eggplant (greenhouse) 37, lettuce 47, *P. lunatus* 124, *H. esculentus* 46, peas 64, chilli (greenhouse) 19, radish (greenhouse) 3, salsify (greenhouse) 20, soy-bean 16, spinach 239, with a yield of 10,332 lb. cut spinach per acre as against 7,144 lb. from untreated seed, and watermelon 85.

Wang (C. M.). **Physiological specialization in Peronospora parasitica and reaction of hosts.**—*Chin. J. sci. Agric.*, i, 4, pp. 249–257, 1944. [Chinese, with English summary. Received June, 1946.]

The reactions of the cruciferous hosts of downy mildew (*Peronospora parasitica*), a widespread and important disease in China, especially in the Yangtse Valley, fall

into four types, namely, susceptible, with normal symptoms; resistant, showing large necrotic spots; highly resistant, characterized by barely discernible necrotic spots; and immune, with no perceptible symptoms. Three varieties of the fungus are differentiated, viz., *brassicae* on *Brassica*, *raphani* on *Raphanus*, and *capsellae* on *Capsella*: they are not cross-inoculable. *P. parasitica* var. *brassicae* comprises six physiologic races [*R.A.M.*, v, p. 711], distinguishable by their effects on ordinary and Chinese cabbage, *B. juncea*, and swede. A dichotomous key to the three varieties of *P. parasitica* and the six races of var. *brassicae* is provided.

Eglitis (M.). **Pflanzenpathologie im Ostland. III. Mitteilung. Untersuchungen über die Möglichkeiten der Bekämpfung von Cercospora beticola Sacc.** [Plant pathology in Ostland. Note III. Investigations on the possibilities of control of *Cercospora beticola* Sacc.]—*Zbl. Bakt.*, Abt. 2, cvi, 5–7, pp. 94–104, 1943. [Received May, 1946.]

In 1937 and 1938 beet leaf spot (*Cercospora beticola*) assumed a devastating form in Estonia. The average harvest for the years 1934 to 1937 was computed at 21·25 tons per ha. and the sugar content at 18·13 per cent., while the corresponding figures for 1938 were 16·9 and 16·82, respectively, representing a loss of 20·5 per cent. of the normal tonnage and 7·2 per cent. of the sugar content. Very encouraging practical results were obtained by treatment of the seed-clusters with ceresan (0·6 gm. per 100 gm., five minutes' shaking in a glass-stoppered vessel), and the mycelium was killed by 24 hours' exposure to a temperature of 75° C. and six hours at 85°. The virulence of both mycelium and spores of the pathogen decreased in seed stored for periods of one to two years.

Berger (K. C.) & Truog (E.). **Boron deficiency in Beets as correlated with yields and available boron.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxvi, pp. 421–425, 1944. [Received May, 1946.]

Boron-deficiency symptoms in beets [*R.A.M.*, xxiv, p. 130] do not appear until the condition has assumed a serious form and caused heavy reductions in yield. A method was therefore devised for the determination of the available boron in soils, involving extraction with hot water, and this permits the detection of deficiency at an early stage when the application of a boron fertilizer is indicated. The results of field trials denoted that sugar beets require a minimum of one part per million of available boron and the table varieties slightly more. Common field crops probably need less than half these quantities.

Jones (H. A.), Walker (J. C.), Little (T. M.), & Larson (R. H.). **Relation of color-inhibiting factor to smudge resistance in Onion.**—*J. agric. Res.*, lxxii, 7, pp. 259–264, 1946.

These experiments confirmed the view that resistance to the smudge disease (*Colletotrichum circinans*) was higher in coloured onions than in white ones [*R.A.M.*, xxv, p. 310], which are highly susceptible to that pathogen, but showed that cream bulbs with the genetic constitution *Ii* are roughly intermediate in resistance between the pure white onions and the coloured ones, and it is considered that the production of hybrid onions of this constitution would be a simple matter. In the six crosses made White Portugal was one parent in five of the crosses and was crossed with Stockton G36, Early Grano, Italian Red, Stockton Yellow Flat, and Yellow Globe Danvers, the sixth cross being Crystal Wax × Italian Red. Plants of the F_1 generation were inoculated with smudge when the bulbs were half grown. Disease indexes in the mature bulbs were: white 46 to 88, coloured 6 to 22, hybrid cream 19 to 70, the most resistant of the last-named being White Portugal × Yellow Globe.

It is suggested that the effect of the recessive white gene *c* upon resistance to *C. circinans* and the difference between the susceptibility of red and yellow varieties resulting from the action of the *Rr* pair of alleles should be studied further. Importance is attached to the fact that the highest and lowest mean indexes of susceptibility in these experiments were found in crosses between white and yellow varieties.

Kuhnholtz-Lordat (M.) & Gastaud (J. M.). **Notes de pathologie végétale.** [Plant pathological notes.]—*Ann. Épiphyt.*, N.S., ix, 2, pp. 207–219, 5 figs., 1943. [Received April, 1946.]

Sphaeropsidales reported on ivy (*Hedera helix*) leaves in the vicinity of Montpellier at various times comprise *Ascochyta diplodina*, *Phyllosticta concentrica*, *P. hederae*, and *P. hedericola* [*R.A.M.*, xii, p. 24]. The first author has not found the *P. hederae* reported by Celotti from Montpellier in 1887, and it is not in the herbarium there. He regards *P. hederacea* as a young stage of *P. hedericola*. The spots produced by *P. concentrica* are dark brown at first with concentric rings, then becoming greyish due to the formation of pycnidia. The broadly oval, sometimes subglobulose conidia measure 10 by 8 to 9 μ. *P. hedericola* causes spots which rapidly become ochre, whitish-grey, or white, sometimes with a few concentric rings at the periphery. They are surrounded by a rather light, yellow-brown band, which imparts a somewhat reddish tinge to the surrounding parts. This ring spreads out into an oil spot, and is itself surrounded by a chlorotic zone. Scattered pycnidia appear as black points and the elongated, irregular conidia measure 5 to 8 by 2 to 2·5 μ. The spots caused by *A. diplodina* also soon turn ochre, whitish-grey, or white and bear scattered black pycnidia. They are surrounded by a narrow, brown cushion sharply distinguished from the green tissues. The conidia are uniseptate rods, measuring 11 by 2 μ.

During 1941, in several parts of Hérault, fig trees became defoliated early in October, and the fruit withered or fell. Underground infection of the trunks by *Rosellinia necatrix* was noted. A key is given to the species of *Phyllosticta* (*P. mespili* and its var. *macrospora*, *P. mespilina*, and *P. mespilicola*) which have been described on medlar (*Mespilus germanica*) in northern Italy; the species attacking this host in Mediterranean Languedoc is *P. mespili*.

During May, 1941, stocks (*Matthiola incana*) growing in a bed facing south at Montpellier showed abundant external infection by *Peronospora parasitica*. Transverse sections of the infected spots showed external productions bearing no relation to the conidia. Hyphae emerged from the stomata, rose perpendicularly to the leaf surface, twisted round upon themselves, branched, and showed rolling at the extremity. They rolled round the leaf hairs or grew along their walls. Strong tufts of mycelium first invaded the substomatal cavity. It seems that in the prevailing atmospheric conditions (wet May, southern aspect) *P. parasitica* developed an ectophytic mycelium.

A distinctive character of the genus *Sphaerotheca* is a single ascus inside a perithecium with simple appendages. Whereas the perithecia are often wrongly figured with a close network outlining a large number of small alveoli, in reality, the alveoli are large, ten sometimes occupying an entire hemisphere of the perithecium. Their shape is never rectilinear, but widely sinuous. Thickening of the net occurs early, and as the perithecium grows the alveoli swell outwards, the thickened net remaining in the bottom of a hollow. A preliminary morphological study of the perithecia of *S. humuli*, using a new clearing method (equal parts of pure hydrochloric acid, density 1·19, and lactic acid, density 1·24), showed that on five different wild hosts the diameters ranged from 83 μ on *Senecio fuchsii* to 104 on *S. cordatus* and the number of alveoli from 10 to 40. The alveoli were separated from each other by furrows.

Compte rendu sommaire des travaux des Stations et Laboratoires de Pathologie Végétale en 1941. [Brief report on the work of the Plant Pathological Stations and Laboratories in 1941.]—*Ann. Épiphyt.*, N.S., viii, 2, pp. 219–223, 1942. [Received April, 1946.]

Investigations carried out at Montpellier by J. Branas and his co-workers, using a variety of metallic salts, give rise to the conclusion that no metal more active than copper against vine mildew [*Plasmopara viticola*] is likely to be found; the rare metals remaining untested, even if proved highly fungicidal, would nevertheless be virtually unobtainable. Bordeaux mixture remains the most effective form of copper. Conclusive evidence was obtained that the toxicity of metals to *P. viticola* is a periodic function of their atomic weight. At Montpellier during a cold, wet season the slight superiority of sublimed sulphur against vine *Oidium* [*Uncinula necator*: *R.A.M.*, viii, p. 750] observed in more northern latitudes was confirmed. At Bordeaux, sublimed sulphur gave completely satisfactory control. The liquids were inferior but the best of them was Bordeaux mixture with 'nekal' sticker. Bordeaux mixture, while ineffective by itself, to some extent rounded off the effect of sulphur against *U. necator*. Potassium permanganate was much less effective, though occasionally it gave good results.

Spray warnings against *P. viticola* were issued for the first time in 1941 by the stations at Avignon, Antibes, and Bordeaux, and with the happiest results. On almost every occasion the warnings coincided with the best date for spraying.

Neergaard (P.). **8. 9. 10. Aarsberetning (er) fra J. E. Ohlsens Enkes plantepatologiske Laboratorium. 1 April 1942–31 Marts 1943. 1 April 1943–31 Marts 1944. 1 April 1944–31 Juli 1945.** [Eighth, ninth, and tenth annual reports from the phytopathological laboratory of J. E. Ohlsen's widow. 1st April, 1942 to 31st March, 1943. 1st April, 1943 to 31st March, 1944. 1st April, 1944 to 31st July, 1945.]—21 pp., 1943; 18 pp., 2 graphs, 1945; 20 pp., 4 figs., 2 graphs, 1945. [English and Esperanto summaries.]

During the period from 1st April, 1942 to 31st March, 1943, 5,510 samples of horticultural seeds were tested [cf. *R.A.M.*, xxiii, p. 427] and the following new records, among others, for Denmark established: *Alternaria circinans* on *Artemisia scoparia*, *Aubrietia hybrida*, and thyme, *Ascochyta calendulae* on *Calendula officinalis* leaves; *Colletotrichum anthurii* (All.) n. comb. (syn. *Gloeosporium anthurii* All., *C. anthurii* Delacr.), with conidia averaging 15·9 by 5 μ (original diagnosis 18 to 20 by 4 to 5 μ), on foliage of *Anthurium scherzerianum*; and *C. godetiae* n. sp., characterized by conidiophores measuring 20 to 30 by 2 μ, hyaline, cylindrical, guttulate conidia, 15 to 21 by 4 to 6 μ, occasionally provided with dark brown, septate setae, 60 to 120 by 3 μ, actively parasitic on *Godetia hybrida* stems. The last-named plant is particularly susceptible to fungal infection, harbouring besides the foregoing *Alternaria tenuis*, *A. tenuissima*, *Botrytis cinerea*, *Phoma* sp., *Stemphylium* sp., *Coniothyrium* sp., *Fusarium* sp., *Marssonina* sp., various moulds, and *Pythium debaryanum*. Of the various seed treatments tested against these pathogens, the most effective were four hours' immersion in 0·5 per cent. Danish uspulun and 0·5 per cent. tillantin. Pomarsol [ibid., xxiv, p. 453] also gave encouraging results, notably in respect of *B. cinerea*, infection with which on the Kelvedon Glory variety was reduced from 11·3 to 0·5 per cent. by an hour's immersion at 0·8 per cent. in one test, and from 9·3 to 0·3 per cent. by the same period at 1 per cent. in another without impairing germination.

In an experiment to determine whether certain pathogens of *G. hybrida* secrete metabolic products toxic to the host, sterilized seeds of Kelvedon Glory and Bijou were germinated in Petri dishes on filter paper moistened with 10, 25, and 50 per cent. filtrates of malt-extract culture solutions of pathogens. Only *S. radicinum* [or *A. radicina*] produced toxins exerting a definitely deleterious effect on

the seeds, which germinated poorly and gave rise to stunted, blackish-brown seedlings.

Between 1st April, 1943 and 31st March, 1944, the examination of 5,322 seed samples disclosed the presence of two new species of *Alternaria*, *A. matthiolae* [= *A. raphani* fide Neerg.] on *Iberis amara* and *I. umbellata*, and *A. senecionis*, the agent of cineraria (*Senecio cruentus*) leaf spot; of a new record for Europe, *Peronospora mesembryanthemi* on *Mesembryanthemum* leaves, originally reported by L. Verwoerd from South Africa (*Ann. Univ. Stellenbosch*, Ser. A, 1, 1924); and of new hosts for *A. circinans* (seakale: *Crambe maritima*) and *A. zinniae* [*R.A.M.*, xxi, p. 492] (China aster: *Callistephus chinensis* and cineraria).

The results of inoculation experiments on seedlings of seven varieties of *G. hybrida* with *A. circinans*, *A. porri* f. sp. *dauci* (Kühn) Neerg., *A. porri* f. sp. *solani* (Ell. & Mart.) Neerg., *A. tenuissima* var. *godetiae* Neerg., *S. radicinum*, and its var. *petroselini* Neerg. indicated that Kelvedon Glory, Sybil Sherwood, and Duke of York are the most susceptible to all the fungi and Bijou the least so, Azaleiflora fl. pl., Gloriosa, and Lady Satin Rose being intermediate in their reactions. In inoculations into Kelvedon Glory seedlings and mature plants, the former were severely attacked by *B. cinerea* and *P. debaryanum*, and slightly by *C. godetiae* and *Phoma* sp., while the latter sustained fairly heavy infection by *B. cinerea* and *C. godetiae* and little or none by the other two organisms. Inoculation tests with *A. circinans* on *Capsella bursa-pastoris*, unlike those of [P. A.] Young [ibid., v, p. 622], gave positive results.

Among the new host records for the period from 1st April, 1944 to 31st July, 1945, when tests were conducted on 4,442 seed samples, may be mentioned *A. circinans* on *G. hybrida* seeds and *Centrospora macrospora* (Osterw.) Neerg., causing severe root rot of *Primula malacoides*, while *Marssonina kriegeriana* as the agent of a serious disease of *Salix alba* var. *tristis* [cf. ibid., ix, p. 813] and mosaic of *Impatiens sultani* have not hitherto been reported in Denmark.

A. tenuissima var. *godetiae* Neerg. 1945 is raised to specific rank as *A. godetiae* (Neerg.) n. comb.

A summary is given of the organization and activities of the Ohlsen phytopathological laboratory during its first ten years of operation (1935–45).

Annual Reports of the New Hampshire Agricultural Experiment Station for the years ending June 30, 1942, June 30, 1943, and June 30, 1944.—*Bull. N. H. agric. Exp. Sta.* 345, 67 pp., 5 figs., 1942; 351, 66 pp., 4 figs., 1943; 354, 67 pp., 1944. [Received April, 1946.]

The following are among the items of phytopathological interest in these reports [cf. *R.A.M.*, xx, p. 103]. M. C. Richards and R. W. Barratt tested a number of sprays for the control of muskmelon powdery mildew [*Erysiphe cichoracearum*] in 1941–2. Severe foliar burning followed the use in the greenhouse at temperatures of 70° to 95° F. of kolofog, Koppers flotation sulphur, and potassium sulphide in dilutions ranging from ¼ to 6 lb. per 100 gals. Of the copper compounds tried, viz., copper oxychloride sulphate (1 in 100 to 2 in 100), Bordeaux mixture (1 in 150), and cuprocide (1 in 100), the first-named was the most satisfactory, though it caused some damage. In 1942–3 the incorporation of emulsified cotton seed or groundnut oil (1 in 800) with copper oxychloride sulphate ensured an even deposit and obviated burning of the leaves. Tests by M. C. Richards indicated that potato tubers showing symptoms of net necrosis, caused by the leaf-roll virus, may be differentiated with a high degree of accuracy in the spring-grading inspection from those with stem-end browning [ibid., xxiii, p. 272].

Repeated experiments by M. C. Richards (with H. R. Barratt in 1943–4) indicate that the causal organism of potato ring rot [*Corynebacterium sepedonicum*], first detected in New Hampshire in 1941, either does not overwinter in the soil or that

infested soil does not serve as a source of inoculum in the central regions of the State.

Numerous commercial tomato varieties, selections, and species of *Lycopersicon* were tested in 1943–4 by M. C. Richards for resistance to late blight (*Phytophthora infestans*). Besides the first-named category, *L. pimpinellifolium*, *L. chilense*, and *L. peruvianum* proved highly susceptible, but a few selections of *L. hirsutum* showed some resistance to a potato isolate of the fungus.

In 1943–4 M. C. Richards compared fermate (1½–100) and mike sulphur (6·6–100) for the control of apple scab [*Venturia inaequalis*] on McIntosh, the schedule comprising the pink, bloom, calyx, and four cover sprays. In a third treatment, Bordeaux mixture was applied in the third and fourth covers to certain trees sprayed with mike sulphur. The numbers of scab spots per leaf in the sulphur, fermate, and Bordeaux plots were 7·47, 6·21, and 2·39, respectively, the percentage of diseased apples 4·80, 3·61, and 3·24, respectively, and the percentage of russeted fruits 2, 7·12, and 4·23, respectively.

Fifty-seventh Annual Report of the Texas Agricultural Experiment Station, 1944.—49 pp., 65 figs. [? 1945. Received May, 1946.]

This report [cf. *R.A.M.*, xxiv, p. 355] contains, *inter alia*, the following items of interest. A new variety of Sudan grass, called Sweet Sudan grass, developed at the Texas Agricultural Experiment Station, is sweet and juicy, like the sweet sorghums, and also resistant to common foliage diseases. Several new, satisfactory sorghum varieties have been developed that are adapted to machine harvesting, and some, including Plainsman, Caprock, and Bonita, are now widely grown. All these three are resistant to *Pythium* root-rot [commonly attributed to *P. arrhenomanes* but now thought due to a complex of factors: ibid., xxiii, p. 101]. A new variety of cantaloupe melon, Texas cantaloupe No. 1, resistant to downy mildew [*Pseudoperonospora cubensis*] and aphids, was expected to be released to growers in June, 1945.

Fifty-fifth Annual Report for the fiscal year ended 30th June, 1945.—*Bull. Wash. St. agric. Exp. Sta.* 470, 167 pp., 1945.

In the section of this report [cf. *R.A.M.*, xxiv, p. 267] dealing with plant pathology (pp. 62–68), S. B. Locke states that during 1944 certified tubers of 16 potato varieties were grown at Harrah, Everson, and Pullman. In the spring of 1945 seed tubers from these stocks were planted at Harrah. The incidence of tuber-transmitted leaf-roll in the Harrah seed averaged 34 per cent., as against 7·3 and 5·8 per cent. for the Everson and Pullman seed, respectively. Earlaine No. 2 was resistant in all three localities; Pawnee, Houma, Sequoia, Sebago, and White Rose were resistant in two; Katahdin, Bliss Triumph, Seedling 5703, Rural New Yorker, and Gold Coin were resistant in one; while Russet Burbank, Green Mountain, Earlaine, Chippewa, and Burbank showed no resistance. The respective reactions of two varieties in one area were often reversed in another. The combined data for all varieties in all the localities showed that as leaf-roll increased from 0 to 15 per cent., reduction in yield increased rather rapidly to 28 per cent. The percentage reductions with 25, 50, and 65 per cent. leaf-roll were 50, 70, and 81, respectively. The ratio of small tubers to U.S. No. 1 tubers increased with increasing amounts of leaf-roll.

J. D. Menzies states that propagation of scion wood from Italian prune trees with various disease symptoms on to peach and myrobalan [*Prunus divaricata*] nursery seedlings showed that a leaf-spot condition and a mottled leaf symptom were both bud-perpetuated, while a leaf-curl reaction was not. A disease indistinguishable from Santa Rosa mosaic [? peach mosaic] was observed on Santa Rosa plum in three orchards, and a mosaic-like mottle causing severe leaf and fruit

distortion on Tragedy plum is also under investigation. Spread of cherry rusty mottle [ibid., xxiv, p. 324], causing increasing damage in the lower Yakima Valley, is being surveyed.

Lucerne witches' broom again caused serious damage near Winthrop, Okanagan County. Confirmation was obtained that *Platymoideus acutus* is a vector of the virus, but other vectors probably exist.

Annual records of the degree of *Rhizoctonia* [*Corticium solani*] infection in potatoes in the rotation plots show that there is great variability in the yearly occurrence of the stem-lesion stage, while the amount of sclerotial formation on tubers is not well correlated with the degree of stem-lesion injury, but is more consistently related to cropping practice. Short rotations without legumes are conducive to severe sclerotial development, whereas two- and four-year rotations with sweet clover [*Melilotus alba* and *M. officinalis*] showed relatively little. In seven-year rotations potatoes immediately following four years of lucerne had the least sclerotial infection, increasing amounts occurring in crops two and three years removed from the legume. Most infection occurred with continuous potato culture and in the two-year potato-wheat rotations. Potatoes alternating with maize or sugar beets were less severely affected.

In second-year field tests with 647 strawberry varieties and hybrids, L. Campbell found that 18 showed symptoms of yellows [yellow edge: ibid., xxii, p. 240]. Leaf spot (*Mycosphaerella fragariae*) [ibid., xxi, p. 533], leaf scorch (*Diplocarpon earliana*) [ibid., xviii, p. 692; xxi, p. 463], and powdery mildew (*Sphaerotheca humuli*) [ibid., xix, p. 107] occurred seriously on 24, 11, and 18, respectively. These hybrids were affected by the genetic weakness 'June yellows' [ibid., xxi, p. 463]. During the second year's growth, 216 strawberry varieties and hybrids were tested in the field for relative susceptibility to root rot [ibid., xxii, p. 240]. Data based on top symptoms and confirmed by the amount of root injury showed that 26 were very susceptible, 119 moderately susceptible, 55 moderately resistant, and 16 highly resistant.

Each of nine different fungicides mixed into the soil in strips failed to control beet black root [ibid., xxii, p. 508], incidence under field conditions ranging from 84·4 to 95 per cent. Incidence of black root in soil treated with superheated steam by machinery was 33·47 per cent. as against 76·61 per cent. in untreated soil.

C. S. Holton states that one recently collected race of *Tilletia caries* [cf. ibid., xxi, p. 284; xxiv, p. 267; xxv, p. 209] appears to be new. Five experimentally produced bunt hybrids representing distinct races tested for seven to ten generations are regarded as pathogenically stable. Two of seven hybrid selections of winter wheat were highly resistant to all races of bunt (*T. caries* [and *T. foetida*?]) [ibid., xxv, p. 298], both being previously untested selections from a Rex × Rio hybrid. Of four spring wheats tested, Doubbi, an Australian durum wheat, was resistant to all races except T-2 (the durum wheat race), whereas Idaed and Hard Federation were susceptible to all races and Marfed resistant to only four. Susceptibility to dwarf bunt [*T. caries*: loc. cit.] was shown by seven out of 33 varieties of winter wheat in one test.

Further work indicated that only one race (No. 2) of wheat flag smut, *Urocystis tritici*, is prevalent in the Goldendale area; the resistance of the Golden variety remained outstanding.

No further races of oat smuts [*Ustilago avenae* and *U. kolleri*] were identified in ten collections tested. One collection represented Race A-14, and six A-15, both newly identified last year and economically significant owing to their virulence towards the Victoria type of resistance. Varieties and hybrids tested showed a high degree of smut resistance, 12 being highly resistant to 22 races, and none susceptible to more than three.

In studies by M. L. Schuster on pea damping-off and root and stem decay, about 50 per cent. of the isolates from seed and seedlings from 1942 to 1945 inclusive, were *Fusarium solani* f. *pisi*. Susceptibility was ascertained to be conditioned by many factors. A highly significant correlation co-efficient was obtained between emergence from untreated and from spergon-treated seed. Variations in stand ranging from 27 to 100 per cent. were noted in 55 seed lots of the same variety. Laboratory germination tests do not always give a good indication of field performance, even of treated seed, particularly if the peas are wrinkled. The iodine bath was as effective as the water dip for determining the amount of cracking. Treatment increased emergence from chipped seed as well as from sound seed.

Watering immediately after planting may cause dissipation of seed protectants. Under dry soil conditions, an organic mercury compound may induce root damage. Excess or deficiency of soil moisture may condition the value of seed protectants. In one of two localities, seed treatment was significant in relation to dates of planting, greater response being noted in the earlier sowing. Poorer stands resulted from seed that remained longer in the soil, but seed treatment equalized this difference.

G. W. Fischer studied 45 new collections of head smut (*U. bullata*) of forage grasses, mainly from the Pacific North-west. Of the 12 known physiologic races, races 1, 2, and 12 were identified 11, 17, and 7 times, respectively. Conclusive evidence was obtained that new improved ceresan used at maximum dosage (i.e., amount adhering to the treated seed after the excess has been screened off), is completely toxic. Thiosan gave complete control of the disease in all replications and on all four grass species used, and all the stands were good. Arasan was somewhat inferior to thiosan; spergon gave poor control.

Of 73 collections of stem [black] rust on grasses made in eastern Washington in 1943–4, 40 were identified by test inoculations as *Puccinia graminis tritici*, 12 as *P. g. avenae*, two as *P. g. secalis*, and two as *P. g. phlei-pratensis*.

Ryбak (B.). **Sur l'immunité dans le cas du crown-gall chez Pelargonium zonale.** [Immunity in the case of crown gall in *Pelargonium zonale*.]—*C.R. Acad. Sci., Paris*, ccxxii, 25, pp. 1462–1464, 1 fig., 1946.

The hypersensitive reactions in the form of longitudinal fusiform fissures in the stem, described by Magrou as characteristic of *Pelargonium zonale* [*R.A.M.* xvii, p. 799] reinoculated with a virulent strain of *Bacterium tumefaciens* [see next abstracts] at a distance from the original site of infection, can also be induced by the inoculation of healthy stems with the bacterium killed by one hour's exposure to a temperature of 56° C. The immunity conferred, however, is purely transient, reinoculation with virulent isolates of the pathogen resulting in the formation of tumours even in the regions of the first inoculation, though the secondary excrescences remain minute.

The hypersensitive reactions are due to a process of cellular detoxication. Under the influence of the bacterial toxins the host cells proliferate actively, thereby liberating an abundance of waste products which diffuse and accumulate slowly at variable, but always short, distances from the point of invasion. The reinoculation, after a month or two, with a virulent strain of the bacterium into the cells adjacent to the tumour initiates a similar process of detoxication, but the sensitization induced by the toxic products of the growth results in the death not only of the cells in immediate proximity to the new sites of invasion, but also of those in the directly over- and underlying layers which are permeated by the toxins. The consequent desiccation causes the separation of all these suberized cells and tangential tension leads to the fusiform rupture.

In the case of inoculation with bacteria killed by heat, the toxins diffuse longitudinally at a very short distance from the site of invasion. Mitogenetic in small

doses, these toxins become necrobiotic in massive concentrations of the order proper to bacteria undergoing autolysis. The stem fissures are much narrower and shorter than those induced by inoculation with virulent isolates near a tumour.

Magrou (J.) & Manigault (P.). **Action du champ magnétique sur le développement des tumeurs expérimentales chez Pelargonium zonale.** [Action of the magnetic field on the development of experimental tumours in *Pelargonium zonale*.]—*C.R. Acad. Sci., Paris*, ccxxiii, 1, pp. 8–11, 1 fig., 1 diag., 1946.

The growth of tumours artificially induced in *Pelargonium zonale* plants of the Jardin des Plantes variety by inoculation through an internode with the *Chrysanthemum frutescens* strain of *Phytomonas* [*Bacterium*] *tumefaciens* [see preceding abstract] was almost completely inhibited by exposure to a magnetic field, whereas the excrescences in the controls attained a diameter of 8 to 12 mm. in 67 days. The anatomical structure of the magnetized tumours did not differ from those of the controls.

Gioelli (F.). **Produzione di tumori per mezzo del Bacterium tumefaciens su culture 'in vitro' di tessuti vegetali.** [The production of tumours by means of *Bacterium tumefaciens* on '*in vitro*' cultures of plant tissues.]—*Nuovo G. bot. ital.*, N.S., xlvii, 2, pp. 452–453, 1940. [Received April, 1946.]

Continuing his investigations on the growth-promoting effects of *Bacterium tumefaciens* [*R.A.M.*, xix, p. 462], the author induced, by inoculation with living bacteria, the formation of large tumours on pieces of living carrot root cultured *in vitro* at 28° to 30° [C.] in the light. These tumours were larger and more prolific than the neoplastic proliferations induced by filtrates of the bacterial cultures and were localized at the point of inoculation. They were produced also in the dark but less markedly. If the carrot tissues were not living the bacterium merely multiplied saprophytically in them. Microscopic examination showed that the tumours were similar in structure to the neo-formations induced by filtrates, that the bacteria were present only in the superficial layers, were intracellular, and did not kill the cells or multiply abundantly in them.

Johnson (T.) & Newton (Margaret). **Specialization, hybridization, and mutation in the cereal rusts.**—*Bot. Rev.*, xii, 6, pp. 337–392, 1946.

In this paper the authors briefly review, with numerous references to the literature of the subject, the main contributions to knowledge that have accrued as a result of the discoveries of physiologic specialization and heterothallism in cereal rusts (*Puccinia* spp.). The headings under which the subject is treated include physiologic specialization of each important rust separately, the reaction of physiologic races to environment, economic significance of physiologic races, hybridization (nuclear phenomena, methods of crossing and selfing, rust characteristics suitable for study, selfing of physiologic races, and crossing studies), and mutation. A bibliography of 242 titles is appended.

Guyot (A. L.). **Études expérimentales sur les Uredinées hétéroiques.** [Experimental studies on the heteroecious Uredinales.]—*Ann. Éc. Agric. Grignon*, Sér. 3, ii, pp. 124–128, 1940–1; iii, pp. 93–99, 1942; iv, pp. 116–147, 1944. [Received January, 1946.]

In these three papers the author's work on rusts [*R.A.M.*, xix, p. 367] is extended. In the first he records the parasitic specialization of certain species of *Uromyces* living on legumes in the Paris basin and the plains of northern France, and having their aecidial stage on *Euphorbia cyparissias*. Peas were slightly attacked by a form of *U. pisi* late in 1937, 1938, and 1939. He summarizes also the parasitism of *Uromyces* on members of the Caryophyllaceae.

The second study made in 1941 treats of several species of *Puccinia* parasitic on the Gramineae. Infection experiments with seven species of *Bromus*, using aecidiospores from *Thalictrum minus*, confirmed the view that this rust was *P. alternans* f. *bromi-erecti*. *P. bromina* was collected from *B. sterilis* and *B. mollis*. Stems of *Avena elatior* were found harbouring *P. coronata*, which proved easily transmissible to other plants of the same species, but not to those of seven other species of *Avena*. Teleutospores of *P. coronata*, collected in the autumn on *A. elatior* and on *Bromus* spp. and left to hibernate outside, produced basidiospores which infected *Rhamnus cathartica* and *R. utilis* the following spring.

In experiments to determine the spring cycle of yellow rust (*P. glumarum*), wheat seedlings reared under glass were exposed outside for seven-day periods during May. No infection resulted during the period from 1st to 18th May; first infection appeared between 18th and 22nd May, uredosori appearing on 3rd June; a second occurred between 25th and 29th May, uredosori appearing on 10th June; whence it seems that the incubation period is from 12 to 15 days. Some confirmation of these results was afforded by field observations of cereals and by open-air sowings of Gramineae. While *P. glumarum* infection of autumn sown wheat and barley and also of wild grasses (*Agropyron repens* and *Hordeum murinum*) was observed from 28th April, the disease did not become manifest on experimental spring sowings of Gramineae in the open air until 6th June, the first uredosori appearing at the same time on *Triticum durum*, *T. spelta*, *T. vulgare*, *Agropyron caninum*, *A. glaucum*, and *Bromus arvensis*, probably from a first period of infection occurring about 20th May. The development of *P. glumarum* on wheat was somewhat intense, a few teleutosori being noted on 22nd July (although they appeared on 13th June on winter barley), but the uredosori were still active on 5th August on leaves not already completely withered.

P. graminis was first seen on winter wheat on 15th July, and the first teleutosori appeared on the 19th. On 22nd July the disease became evident on spring-sown rye; the uredo stage on *H. maritimum* was seen on 5th August; while on 14th October uredosori of *P. graminis* were still numerous on stems and ears of *Lolium perenne*. Winter barley bore uredosori and teleutosori of *P. simplex* [*P. anomala*] from 6th June; and the first uredosori of *P. triticina* [on wheat] appeared on 4th July, no teleutosori being noted.

In the third study covering 1942 and 1943 notes are presented on the time and extent of the incidence of species of *Puccinia*. *P. bromina* was observed on *Bromus* spp. in both years, as was *P. coronata*, which occurred also on *Rhamnus* spp. in both years and on experimentally exposed oats and *A. fatua* and on many grasses in 1943. Uredosori of *P. dispersa* were first observed on rye on 3rd June in 1942 and on 27th May in 1943, the teleutosori appearing on 26th June, 1942, but not in 1943. The dates of appearance of *P. glumarum* on wild grasses are given. Cereals were badly attacked in June, 1942, the wheat varieties Vilmorin 23 and 27 being seriously affected, Hybrid 40 and Pont Caillou only slightly so, while Ile de France was practically resistant. Further exposure experiments, using seedlings of wheat (Hybrid 40 and Vilmorin 23), barley (winter and spring), and bromes confirmed the findings of the previous year and established that favourable periods for infection alternate with unfavourable periods. A list of hosts of *P. glumarum* for the Grignon region is given. *P. graminis* appeared in 1942 on the experimental plots of winter wheat, where it was very active in early July, and on barley and oats particularly at the end of July. Rye remained unaffected even near other infected cereals. In 1943 there was intense early infection mostly on wild grasses. Infection experiments on a variety of seedling grasses under glass in 1942 and more extensively in 1943, the results of which, together with numerous uredospore measurements, are fully tabulated, established that there are a number of biologic races of *P. graminis* in the Grignon region. Those on cereals have larger uredo-

spores (29 to 33 μ long) than those on wild grasses (up to 27 μ long). A scheme setting out the succession of these strains on the various hosts during the season is given. Wheat appears to have two strains, one early and the other late. *P. persistens* occurring on *Thalictrum glaucum* was used to infect *Agropyron* spp. and wheat. *P. poarum* from *Tussilago farfara* infected *Poa* spp. *Puccinia anomala* infection appeared repeatedly from mid-May to mid-July on experimental barley. *P. triticina* was active on wheat from the end of June and on the experimental plots from 17th June in 1942; in 1943 it appeared on 2nd June.

Guyot (L.). **Étude biométrique de Puccinia graminis (rouille noire des Graminées),** [A biometric study of *Puccinia graminis* (black rust of Gramineae).]—*C.R. Acad. Sci., Paris,* ccxx, 19, pp. 700–701, 1945.

The examination by the author and A. Saccas of nearly 10,000 uredo- and teleutospores from 262 samples of cereal black rust (*Puccinia graminis*) collected in various parts of the Old World revealed dimensional disparities of sufficient magnitude to justify their relegation to the following new subspecies or varieties: subsp. *minor* on *Anthoxanthum* and *Cynosurus*: uredo- and teleutospores (mean) 22 to 25 by 15 to 17 μ and 30 to 45 by 18 and 21 μ, respectively; subsp. *media* on *Agrostis, Aira, Alopecurus, Arrhenatherum, Calamagrostis, Dactylis, Festuca, Hordeum* (wild), *Lolium, Phleum, Poa, Vulpia*: 22 to 30 by 15 to 19 μ and 31 to 51 by 16 to 22 μ, respectively; var. *erikssoni* on *Agrostis, Aira, Alopecurus, Arrhenatherum, Dactylis, Festuca,* and *Hordeum* (wild): 23 to 30 by 15 to 18 μ and 37 to 50 by 16 to 22 μ, respectively; var. *calamagrostidis* on *Calamagrostis*: 25·8 by 16·4 μ and 46 to 51 by 19 to 21 μ, respectively; var. *lolii* on *Lolium*: 22 to 27 by 15 to 18 μ and 31 to 44 by 17 to 21 μ, respectively; var. *vulpiae* on *Vulpia*: 23 to 26 by 15 to 18 μ and 47·5 by 20·7 μ, respectively; subsp. *major* on *Aegilops, Agropyron, Avena, Bromus, Elymus, Hordeum* (cultivated). *Secale, Triticum*: 24 to 36 by 15 to 20 μ and 42 to 60 by 16 to 23 μ, respectively; var. *stakmani* on *Agropyron, Avena, Bromus, Hordeum* (cultivated), and *Secale*: 24 to 31 by 15 to 20 μ and 42 to 57 by 16 to 23 μ, respectively; var. *tritici* on *Aegilops* and *Triticum*: 28 to 35 by 17 to 20 μ and 45 to 58 by 17 to 22 μ, respectively; and var. *elymi* on *Elymus*: 29 to 36 by 17 to 19 μ and 54 to 60 by 18 to 23 μ, respectively.

Wallin (J. R.). **Parasitism of Xanthomonas translucens (J. J. & R.) Dowson on grasses and cereals.**—*Iowa St. Coll. J. Sci.*, xx, 2, pp. 171–193, 11 figs., 1 diag., 1946.

The outbreak in Iowa on *Bromus inermis* in the autumn of 1941 of a bacterial leaf disorder not previously recorded on this host, causing brown or blackish, saturated, hyaline streaks on the foliage in fields and pastures, led to the recovery from the streaks of a yellow bacterium, which proved morphologically, culturally, and biochemically similar to the barley, rye, and wheat strains of *Xanthomonas translucens* [*R.A.M.*, xxv, p. 337]. The disease on barley and rye has been known as bacterial blight and on wheat as black chaff but since the symptoms are so much alike on all hosts the author proposes the name '*Xanthomonas* streak'. In subsequent studies over three years, the suspected overwintering of *X. translucens* [ibid., xx, p. 489] was established in brome and timothy [*Phleum pratense*] foliage in the field and the reinoculation of young leaves in the spring from these sources was demonstrated. The brome-grass race, as shown by the like reactions of six isolates in cross-inoculation tests on barley *B.* spp., rye, wheat, and oats, is considered distinct from Hagborg's *X. translucens* f. sp. *cerealis* [ibid., xvi, p. 91] which is raised to varietal rank. Six pathogenic races of *X. translucens* var. *cerealis* have been differentiated. They all attack barley, *B.* spp., *Agropyron repens*, oats, rye, and wheat, but the following differences in their behaviour on seven oats varieties and thirteen *B.* species, including two varieties of *B. inermis*, have been observed:

race I attacks Marion and Erban oats, but not *B. popovii* or *B. pumpellianus*; race II parasitizes Marion and Erban oats, but not *B. inermis* var. Fischer, *B. popovii*, *B. pumpellianus*, *B. tomentellus*, or *B. tectorum*; race III infects Marion, C.I. 4301, and Erban oats, but is inactive on *B. inermis* var. Fischer, var. 951, and *B. pumpellianus*; race IV attacks Boone, Marion, Clinton, and Erban oats, and all *B.* spp.; race V infects Boone, Marion, Tama, Clinton, C.I. 4301, Erban, and C.I. 4327, but *B. inermis* var. 951 and var. Fischer and *B. popovii* are immune from it; while race VI is a pathogen on Marion, Clinton, C.I. 4301, Erban, and C.I. 4327 and all 13 *B.* spp.

Wang (T. H.). **Crossing inoculation experiments of loose smut collected on common Wheat and turgidum Wheat.**—*New agric. J. Fukien, 1942*, 2, pp. 396–403, 1942. [Chinese, with English summary. Received 1946.]

Cross-inoculation experiments by the direct contact, spore-suspension, and partial-vacuum methods with six collections of loose smut (*Ustilago tritici*) from *Triticum turgidum* and eight from common wheat in south-western China established the existence of two physiologic races of the pathogen. The one from common wheat caused 64 per cent. infection on the three *T. vulgare* varieties tested, i.e., Tsing-Hwa University Nos. 507, 519, and 540, but did not attack the three of *T. turgidum* (T.H. 383, 444, and 10187), whereas the race from *T. turgidum* produced 41·1 per cent. smut on the varieties of this species but was almost innocuous to common wheat (0·4 per cent.).

Ko (S. Y.), Torrie (J. H.), & Dickson (J. G.). **Inheritance of reaction to crown rust and stem rust and other characters in crosses between Bond, Avena byzantina, and varieties of A. sativa.**—*Phytopathology*, xxxvi, 3, pp. 226–235, 1 graph, 1946.

At the Wisconsin Agricultural Experiment Station a study was conducted on the mode of inheritance of reaction to crown and stem [black] rusts of oats (*Puccinia coronata* and *P. graminis*), several kernel characters, and earliness between crosses involving certain varieties of *Avena sativa* and Bond (*A. byzantina*) [*R.A.M.*, xix, p. 206].

The segregation ratios for crown-rust reaction in all the crosses except Bond × S.D. 334 are explicable either on the hypothesis of two complementary factors carried by Bond [loc. cit.], or on that of two factor pairs, S a factor for resistance to the disease and I a factor partly inhibiting the operation of S, as suggested by Torrie [ibid., xix, p. 399]. Plants heterozygous for both factor pairs were more susceptible in the field than in the greenhouse.

A single factor pair with dominance of resistance governed the response of the crosses to black rust.

Crosier (W.). **Chemical control of seed-borne fungi during germination testing of Peas and Sweet Corn.**—*Phytopathology*, xxxvi, 2, pp. 92–99, 1946.

All the chemical preparations used in these germination tests, viz., 0·15 per cent. (by weight) arasan [see next abstract], 0·06 per cent. Du Pont 1452 C (7·7 per cent. ethyl mercury para-toluene sulphonalide), 0·22 per cent. semesan jr., and 0·11 per cent. United States Rubber Compound No. 604 (2,3-dichloro-1,4-naphthoquinone), gave partial control of the seed-borne fungi of Stowell's Evergreen Sweet Corn [maize], Du Pont 1452 C being particularly effective. The increased germination of the treated seed was parallel with the control of *Diplodia zeae* [*R.A.M.*, xxv, p. 332], but there was no evidence that *Rhizopus nigricans* [*R. stolonifer*] alone exerted any adverse effect in this respect. Only one of the chemicals, U.S.R. No. 604, was phytotoxic to the maize seed, judging by the size and development of the seedlings; all the others, in fact, increased the green weight of the combined seed and seedlings.

U.S.R. No. 604 was rather more effective than arasan, 0·2 per cent. ceresan, semesan, and 0·2 per cent. spergon in the control of Thomas Laxton pea seed moulds and bacteria [ibid., xviii, p. 495], but arasan and ceresan gave the heaviest weight increases. Arasan and spergon were the most efficient protectants of pea seeds planted in soil naturally infested with *Fusarium* spp., *Pythium ultimum*, and *Rhizoctonia* [*Corticium*] *solani*, permitting only 5 per cent. decay.

Crosier (W.) & Patrick (S.). **Arasan for control of fungi in germinating Corn seed.**—*Phytopathology*, xxxvi, 2, pp. 162–164, 1946.

Rhizopus nigricans [*R. stolonifer*] on fairly clean germinating maize seed was effectively combated by arasan [see preceding abstract] alone or mixed with wheat flour in the proportions of 67 : 33, 50 : 50, and 33 : 67, giving arasan adherence of 2·3, 1·3, 0·9, and 0·6 oz. per bush., respectively. On heavily infested seed, however, containing 8 to 20 per cent. dead kernels, the situation of the mould beneath the pericarp tended to protect it from superficial contact with the fungicide, and the two higher concentrations were more effective in such cases. The incidence of *Diplodia zeae* and *Fusarium* spp. in the seed was low, but their development on treated seed was retarded and the size of the colonies reduced. The increases in the green seedling weight of the treated seed lots are probably attributable to some other factor besides fungal control.

Kent (G. C.). **Some factors in the production and germination of spores of Diplodia zeae in culture.**—*Iowa St. Coll. J. Sci.*, xx, 2, pp. 259–263, 1946.

In laboratory tests it has been found that the germination of spores of *Diplodia zeae* [*R.A.M.*, xvi, p. 245] may vary from 0 to 99 per cent. Experiments with a number of nutrient media showed that the formation of pycnidia and germinable conidia was greatest on a thin stratum of oatmeal extract agar in an Erlenmeyer flask incubated at 20° C. in light. Spores washed in sterile water germinated better than those not washed and carrot extract was the most favourable suspending liquid. Washed spores in this medium showed 90 per cent. germination after 12 hours at 28° to 30°.

Ullstrup (A.). **An undescribed ear rot of Corn caused by Physalospora zeae.**—*Phytopathology*, xxxvi, 3, pp. 201–212, 3 figs., 1946.

Maize in Indiana has been affected for some years by a hitherto undescribed ear rot, the generally low incidence of which rose locally to 10 per cent. in 1944. Premature bleaching of the husks is the first symptom of infection, followed by the gradual cohesion of the husks and their attachment to the kernels through the growth of the felty, white mycelium, which soon shows irregular, grey blotches and streaks, especially near the base of the ear, while the black sclerotia beneath the pericarps impart a speckled appearance to the kernels. Heavily infected kernels are often black at the tip, the discoloration extending for varying distances towards the crown. Under humid conditions the seed coat shows black streaks, and in severely infected kernels the embryo is completely overrun by the black mycelium, the stromatic layers of which are frequently visible below the seed coats. There is a certain amount of shredding of the cob at the ear base, and the husks of completely decayed ears are dark grey, the cobs and kernels being reduced to a dry, grey-black, pithy mass. Infection generally occurs near or through the butt of the ear, but occasionally the tip may be the site of invasion.

The grey ear rot (the common name proposed for the disease) may be distinguished at a relatively early stage from the similar infection caused by *Diplodia zeae* by the slate-grey coloration and the presence of black sclerotia in the cob, while the grey-black hue and dry pithiness of entirely rotted ears are further differential features.

In comparative cultural studies on the grey ear-rot fungus, *Macrophoma zeae* [*R.A.M.*, vi, p. 755], and *Physalospora zeae* [ibid., x, p. 305], the marked similarities between the three organisms, e.g., as regards growth rate (32·4, 32·5, and 32·6 mm. daily increment, respectively), loss of viability by all in a little over a year, and the development of apparently non-functional pycnidia in the life-cycles strongly suggested an interrelationship. In further experiments to verify this hypothesis, cultures of the grey-rot fungus and of *P. zeae* on sterile maize stalks produced pycnidia and pycnospores identical with those of *M. zeae*, whence it is inferred that the grey ear-rot fungus is *M. zeae*, the latter being the imperfect state of *P. zeae*. Further evidence in support of this view was afforded by the results of field inoculations on maize ears, in which the symptoms induced by *P. zeae* were indistinguishable from those observed on ears naturally or artificially infected by *M. zeae*. *P. zeae* differs from *P. zeicola* (*Diplodia frumenti*) [ibid., xii, p. 366] in its symptomatology and morphology, the asci and ascospores of the former (Indiana collections) measuring 90 to 175 by 12 to 18 and 21 to 33 by 8 to 11 (mean 26·8 by 10) μ, respectively, and those of the latter 95 to 140 by 10 to 13 and 13 to 27 by 6 to 11 μ, respectively.

A hithero unrecognized fruiting body, believed to represent a stage in the life-cycle of *P. zeae*, consists of carbonous, globose pycnidia, 150 to 250 μ in diameter, protruding from the host mesophyll by means of a long neck, sometimes bi-, rarely trifurcate, with numerous non-germinating, hyaline, unicellular microspores, 2 to 4·8 by 1 to 2 (mean 4 by 1·6) μ, exuded in droplets of a mucoid matrix. The function of these organs, if any, in the perpetuation of the fungus is still obscure, and the factors promoting the spread and the development of the disease are likewise in doubt, though a reasonable assumption is that leaf infections, either of the previous or current year, are the main source of inoculum. The ploughing-under of infected maize debris is the only control measure practicable in the light of present knowledge.

Olive (L. S.), Lefebvre (C. L.), & Sherwin (Helen S.). **The fungus that causes sooty stripe of Sorghum spp.**—*Phytopathology*, xxxvi, 3, pp. 190–200, 4 figs., 1946.

The morphology of the fungus responsible for sooty stripe of sorghum, Sudan grass, and Johnson grass (*Sorghum halepense*) in the southern States of the American Union is described and its taxonomy discussed. It resembles *Gloeocercospora sorghi* Bain & Edgerton [*R.A.M.*, xxii, p. 302 and below, p. 397] in the possession of sporodochia and sclerotia, but the same organism was named *Septorella sorghi* by Ellis & Everhart in 1903 (*J. Mycol.*, ix, p. 164) in the belief that the fruiting body was a pycnidium. In 1920 Miura established the genus *Ramulispora* and named the sorghum pathogen *R. andropogonis* (*Rep. Koshurei agric. Exp. Sta. S. Manchur. Ry Co.* 11, p. 43, 1920), and in 1932 the species was transferred to *Titaeospora* Bubak under the name of *T. andropogonis* (Miura) Tai [*R.A.M.* xii, p. 248]. The fructification of the sorghum fungus, however, is a sporodochium, and its spores are typically branched, so that it cannot be accommodated in *Titaeospora*, which forms true acervuli and is characterized by conidia with basal fusions. Since Miura's fungus agrees perfectly with that investigated by the writers, it is proposed to retain his generic name of *Ramulispora* but to transfer it as *R. sorghi* (Ell. & Ev.) Olive & Lefebvre n. comb. in an emended form to the Tuberculariaceae, thereby abolishing the subfamily Hyaloramulisporae of the Melanconiales.

The elongate-elliptical lesions produced by *R. sorghi* on the leaves of its hosts are straw-coloured in the centre, with prominent purple borders, and usually covered at maturity with numerous black sclerotia, 53 to 170 μ in diameter. In a humid atmosphere sporodochia emerge through the stomata and produce pale

pink, gelatinous masses of curved, individually hyaline, 3- to 8-septate conidia, 38 to 86·3 by 1·9 to 3 μ, generally furnished with two, sometimes one or three, non- to triseptate lateral branches, 5 to 53 by 1·1 to 2·5 μ. The organism overwinters by means of the sclerotia, which germinate and give rise to conidia in the spring.

R. sorghi develops very slowly on artificial media in the form of raised, tuberculate, black masses, on which the conidia appear in pale pink, gelatinous aggregates. Inside the agar medium the growth habit and sporulation of the fungus are typical of the Moniliaceae.

Greenhouse inoculations on several sorghum varieties, Sudan grass, and Johnson grass resulted in the development of the characteristic lesions and fructifications of *R. sorghi*.

Harvey (E. M.) **Changes in Lemons during storage as affected by air circulation and ventilation.**—*Tech. Bull. U.S. Dep. Agric.* 908, 32 pp., 9 graphs, 1946.

From 1938 to 1941, Eureka lemons of Californian origin were studied to determine the physiological changes occurring over long periods of storage in relation to the rot caused by *Alternaria citri* [*R.A.M.*, xvii, p. 389], and the comparative effects of ventilation, air circulation, and still air on such changes and on the keeping quality of the fruits. Air circulation was found to occupy an intermediate position between ventilation and still air, generally nearer the latter, and cannot be recommended as an alternative to the conditions provided by commercial storage. The amount of carbon dioxide accumulating in commercial storage is insufficient to injure the lemons, but mould emanations and those of the fruits themselves may easily cause deleterious effects during protracted periods.

The percentage of green buttons and their rate of change from one colour category to another afford a practical means of predicting the maximum safe duration of storage for a given lot of lemons. The first external symptom of infection by *A. citri* seldom indicated decay in more than 1 per cent. of the fruits. When at least 2 per cent. showed outwardly signs of rot, the lot was considered to have reached 'decay break' or definite susceptibility to the fungus. Lemons picked in midwinter were the best for storage.

Adams (J. A.) & Wheeler (E. H.). **Rate of development of milky disease in Japanese Beetle populations.**—*J. econ. Ent.*, xxxix, 2, pp. 248–254, 1946.

Under the climatic conditions of southern New York State, satisfactory control of the Japanese beetle (*Popillia japonica*) in two years instead of four was experimentally shown to be feasible by raising the dosage of spore dust of its bacterial antagonist, *Bacillus popilliae* [*R.A.M.*, xxiv, p. 415], from the current light rate of 2 to 2,000 lb. per acre.

Drechsler (C.). **A new Hyphomycete parasitic on a species of nematode.**—*Phytopathology*, xxxvi, 3, pp. 212–217, 1 fig., 1946.

Four of the ten nematode-destroying Hyphomycetes described by the author in a paper published in 1941 [*R.A.M.*, xxi, p. 15], viz., *Acrostalagmus bactrosporus*, *A. obovatus*, *Cephalosporium balanoides*, and *Spicaria coccospora*, closely resemble the insect parasites assigned to the same genera, and similar affinities are characteristic of a fifth fungus, *A. zeosporus* n.sp., of which a full account is given. It developed profusely in maize meal agar plate cultures overgrown by the mycelium of *Pythium ultimum* and then planted with partially decayed crabgrass (*Digitaria sanguinalis*) refuse containing several species of nematodes, of which *Panagrolaimus subelongatus* was the only one attacked.

Barthelet (J.). **L'anthracnose des Agaves. [Agave anthracnose.]**—*Ann. Épiphyt.*, N.S., viii, 2, pp. 111–120, 3 pl., 1942. [Received April, 1946.]

The most important disease of agaves on the Côte d'Azur, France, is anthracnose, due to *Colletotrichum agaves* [*R.A.M.*, xxii, p. 90]. It was first reported from Marseilles in 1921, and has been observed by the author on a large number of *Agave americana* plants between Saint Raphäel and Mentone and further inland.

Light brown, slightly depressed leaf spots, 1 to 2 cm. in diameter, first appear. These are scarcely perceptible on dark-leaved species such as the sisal agave *A. rigida* [var. *sisalana*], but are conspicuous on the *variegata* types of *A. americana*. In severe attacks they spread and merge to occupy the whole width of the leaf. Both the spots and larger areas are surrounded by a light green halo and later become black. Round the lesions a zone of tissue not invaded by the mycelium turns brown and becomes crinkled longitudinally. Later, the centres of the spots become whitish and small protuberances develop in concentric circles on both leaf surfaces; these burst, and expose reddish-beige stromatic masses consisting of dense tufts of mycelium, 1 to 2 mm. wide and 1 mm. high, bearing conidia. The peripheral leaves are those most affected, the oldest sometimes forming a withered ring on the ground. Infection reduces the ornamental or fibre value of the agaves and may completely destroy the young suckers.

The intercellular, varicose hyphae measured 2 to 3 μ in diameter. This mycelium formed subepidermal stromata. The hyaline conidiophores measured 30 to 40 by 3 to 4 μ. The setae measured 90 to 100 by 5 μ, were brown at the base, and sometimes branched. The subcylindrical, hyaline conidia measured 28 to 35 by 6 to 7 μ. The pink colour was due to oil globules which filled the spores at maturity.

Hedgcock identified *C. agaves* (*Rep. Mo. bot. Gdn* 16, pp. 153–156, 3 pl., 1905) on material from Mexico, and *C. catenulatum*, a nearly related species, has been recorded on *A. angustifolia marginata* from British Guiana [*R.A.M.*, x, p. 341]. Other fungi producing anthracnose symptoms on agaves, which might be confused with those of *C. agaves*, are *Nectriella miltina*, forming large, clear, necrotic areas with dull red perithecia, *Coniothyrium concentricum* var. *agaves* which attacks the tips of the leaves and forms fructifications scarcely projecting from the epidermis and often has pycnidia [ibid., viii, p. 106], and *Leptosphaeria obtusispora* Speg. f. *agaves* Barth. observed by the author on *A. ferox*, where it forms large, irregular, roundish, yellow-green areas with white centres bearing numerous perithecia, and on *A. striata* where the dried leaf ends bear perithecia. This new form species has perithecia averaging 250 to 300 μ in diameter, asci measuring 105 to 110 by 11 to 13 μ, and containing eight yellowish-brown, 5-septate ascospores 24 to 26 by 6 to 7 μ. The fungus found by McDonald on sisal in Kenya [ibid., iv, p. 591] may be the same. Other organisms found by the author on agave comprise a *Sphaeropsis* on *A. polyacantha*, a *Phomopsis* on *A. coccinea*, *Stagonospora macrospora* on *A. americana*, and a *Pleospora*.

As regards control, fungicides cannot be recommended for sisal; copper sprays might be useful on ornamental species. The affected leaves should be removed and burnt, although this will not give complete control since fructifications remain on the leaf bases.

Wade (G. C.). **Botrytis corm rot of the Gladiolus—its cause and control.**—*Proc. roy. Soc. Vict.*, N.S., lvii, 1–2, pp. 81–123, 3 pl., 3 graphs, 1946.

Part of this work has already been described from another source [*R.A.M.*, xxiv, p. 373]. The causal organism is considered to be *Botrytis gladioli* [ibid., x, p. 274] of which the following description is given: mycelium white and fluffy, hyphae when young 4 to 6 μ and when mature 12 μ in diameter; sclerotia, developing after six days on potato dextrose agar, at first creamy then black, smooth; macroconidia abundant on the plant but not in culture; conidiophores brown, 12 to

14 μ diameter with cells averaging 170 to 290 μ in length; conidia ovoid, 13 to 18 (average 15) by 11 to 12 (12) μ, thus considerably smaller than those described by Klebahn [loc. cit.] but agreeing with those given by W. C. Moore [ibid., xix, p. 153] and B. O. Dodge and T. Laskaris [ibid., xx, p. 364]; microconidia spherical, 2 μ diameter, not observed on natural media but developed freely submerged in potato dextrose agar after one month; sporodochia olivaceous and penicillate. The fungus has an optimum temperature of 21° C. and a maximum of 30°. Light stimulates the production of conidia and sclerotia. Dextrose increased the rate of growth in the presence of vitamins; sodium nitrate also increased growth rate. Microchemical tests showed accumulations of starch in actively growing lesions but not in those where the disease has been arrested, in which case a suberized layer developed round the diseased tissue. Diseased corms contain an amber-yellow, water-soluble pigment which changes to vinaceous-rufous on addition of alkali.

Pathogenicity of *B. gladioli* was established by artificial infection through needle punctures and retro-culture. The disease has been detected in the field on *Gladiolus primulinus* and *G.* hybrids. It has been induced by inoculation in *G. colvillii* and *Ixia grandiflora.*

Davis (B. H.). **Guignardia rhodorae, the perfect stage of Phyllosticta maxima on Rhododendron.**—*Mycologia*, xxxviii, 1, pp. 40–51, 1 fig., 1946.

The occurrence in leaf-spotting lesions on *Rhododendron* spp. in New Jersey of the pycnidial, spermagonial, and perithecial states of a fungus referred to *Guignardia rhodorae* (Cooke) n. comb. is recorded. The reddish-brown lesions, with slightly darker margins, are usually marginal (ranging from 3 to 40 by 2 to 20 mm.), but may occur anywhere on the lamina (2 to 20 mm. in diameter). Cultures obtained from tissue plantings, pycnospores, and ascospores showed that all states belong to the same fungus and produced pycnidia, but not spermagonia or perithecia.

The pycnidial state has characters in common with *Phyllosticta maxima.* The black epi-, rarely hypophyllous pycnidia, 125 to 200 μ in diameter, produce ovoid to globose-elliptic (or piriform), hyaline, granular pycnospores, 11·5 to 17·5 by 7·5 to 9·5 μ.

The spermagonia usually develop later than the pycnidia. They are small, black, from 60 to 125 μ in diameter, and bear long, narrow, dumb-bell-shaped, non-germinable spermatia 5 to 8·5 by 1 to 1·5 μ; under moist conditions these emerge as an amber-coloured drop at the ostiole. These characters are comparable with those of *P. saccardoi.*

The perithecia are epiphyllous, globose to depressed-globose, immersed 125 to 200 μ in diameter, the asci fasciculate, clavate, with rounded tips and short stalks, 80 to 120 by 12·5 to 16 μ, with a thickened apex, and the ascospores sub-biseriate, broadly elliptical (sometimes sub-rhomboidal), 15 to 19 by 7·3 to 10·2 μ.

P. maxima is distinct from *P. rhododendri* and also from the fungus determined by Tengwall as *P. maxima* and regarded by him as the imperfect state of *Venturia rhododendri* [*R.A.M.*, iii, p. 721].

Severin (H. H. P.). **The susceptibility of perennial Delphiniums to six viruses.**—*Hilgardia*, xiv, 10, pp. 549–570, 2 figs., 1942. [Received February, 1946.]

Six studies are presented of the symptomatic and varietal reactions of perennial *Delphinium* to the following viruses [cf. next abstract]: tomato spotted wilt [*R.A.M.*, xvii, p. 52], common cucumber mosaic [loc. cit.], western cucumber mosaic [ibid., xx, p. 189], tobacco ring spot [ibid., viii, p. 139], tobacco mosaic, and beet curly top [ibid., xvi, p. 387].

Spotted wilt is the most serious disease of perennial *Delphinium* along the Californian seaboard and whole fields have been infected by it. Early symptoms vary and often recall those of *Delphinium* calico [ibid., xxii, p. 207]. Pale green,

circular, elliptical, or irregular areas occur on leaves experimentally infected with extract from calla (*Zantedeschia aethiopica*), and at times large, lemon-yellow patches spread into the leaf lobes and later develop single or double chlorotic rings. Green or chlorotic veinbanding may be seen in the yellow areas. Later symptoms are more stable in their occurrence. Black rings of various sizes and irregular formation surround chlorotic tissue, which turns black on the lower leaves; the blackening may extend over the lobes, setting up necrosis of the petioles and veins. The virus spreads up the plant and to new shoots which develop after the old stock has died.

Extensive experimental inoculation of *Delphinium* plants by the author with common and western cucumber mosaics, respectively, and a few with tobacco ring spot was always followed by systemic infection, but that recorded in the case of tobacco mosaic was local, and only the inoculated leaves showed disease symptoms. Throughout these detailed and carefully tabulated experiments, the occurrence of spotting or blotching, with yellowing of the leaves, usually leading successively to chlorosis and finally necrosis, were more or less constant symptoms. Experiments undertaken for scientists and commercial and private growers showed the Wrexham *Delphinium* to be immune from the curly-top virus transmitted by the leafhopper, *Eutettix tenellus*. It cannot, therefore, be considered to have any causal connexion with phyllody and virescence in *Delphinium*.

Severin (H. H. P.). **Viroses of annual Larkspurs.**—*Hilgardia*, xiv, 10, pp. 585–594, 2 pl., 1942. [Received February, 1946.]

In a series of experiments annual larkspurs (*Delphinium*) were shown to be naturally infected with the viruses of California aster yellows, celery calico [*R.A.M.*, xxii, p. 207], and [beet] curly top; and while plants have not been found in central-coastal regions infected by western cucumber mosaic virus, 108 or 93·1 per cent. of 116 experimentally inoculated annual larkspur plants became infected. Some plants with black leaves suggesting infection by the tomato spotted wilt virus have been found.

The first symptom of aster yellows was a chlorosis of the stem and flower stalk followed by a yellowing of the foliage. Drops of clear sap sometimes exuded from the petioles and stems of experimentally infected annual larkspurs, later turning brown and forming, both in artificially and naturally infected plants, a characteristic crust. Phyllody and virescence, similar to conditions described in a previous paper [loc. cit.], were noted. The virus was successfully transferred from naturally infected larkspurs to asters and celery by leafhoppers.

Extract from larkspurs transferred by mechanical inoculation caused symptoms of celery calico in celery, Turkish tobacco, and White Spine cucumbers. This virus causes in larkspur leaves yellowing in which small green areas are embedded.

Beet curly-top virus in larkspurs caused stunting, apical leaf-bunching, and downward curling of the lower and intermediate leaves. The virus was transferred from naturally infected larkspurs to sugar beet by means of the beet leafhopper [*Eutettix tenellus*].

Symptoms of western cucumber mosaic, difficult to detect in larkspurs with the naked eye, appear under the binocular microscope as a mottling of chlorotic areas which later coalesce to form streaks. In severe cases stunting and leaf-bunching occur.

Johnson (E. M.). **Two legume viruses transmissible to Tobacco.**—*Phytopathology*, xxxvi, 2, pp. 142–147, 3 figs., 1946.

Isolated lucerne plants bearing a few irregular, often indistinct, chlorotic blotches on an otherwise normal leaflet have been observed in a few Kentucky fields. The virus responsible for the condition is mechanically transmissible at greenhouse

temperatures in spring and autumn only to Kentucky 101 red clover, white clover, Dwarf Telephone peas, Stringless Green Refugee beans (*Phaseolus vulgaris*), June Pink and Marglobe tomatoes (also by grafting), Pompom *Zinnia* [*elegans*], Long Green cucumber (also by means of *Cuscuta* sp.) [*R.A.M.*, xxiv, p. 136], *Phytolacca americana*, and California Wonder [chilli] pepper. It was transmissible from diseased to healthy Grimm lucerne plants exclusively by aphids. On lucerne, the clovers, peas, tobacco, cucumber, and chilli the symptoms consisted of systemic mottling, accompanied in peas by stem and petiole necrotic streaks, dwarfing, and distortion; in tobacco and chilli by necrotic or chlorotic ring- and line-patterns, dwarfing and distortion, and in cucumber by chlorotic or necrotic spots on the rubbed leaves, dwarfing, and distortion. Beans, tomatoes, *Z. elegans*, and *P. decandra* reacted by the development of foliar necroses, accompanied in tomatoes and *A. elegans* by dwarfing and distortion, the former also showing necrotic streaks on the stems and petioles.

Sporadic infection of white clover (*Trifolium repens*) has also been observed, some of the leaves of diseased plants bearing irregular, pale yellow, mottled interveinal lesions. The virus is transmissible by rubbing to healthy plants of red clover, peas, beans, and tobacco, all of which respond by systemic mottling accompanied in peas by stem and petiole necrotic streaks, dwarfing, and distortion, in beans by foliar necroses, and in tobacco by dwarfing, distortion, and necrotic or chlorotic line patterns.

Both viruses withstood dilution to 1 in 100 but not to 1 in 500 and desiccation at room temperature for 15 but not for 30 days: the lucerne virus was inactivated by ten minutes' exposure to a temperature of 60°, while that of white clover succumbed at 58°, and the former resisted 72 but not 96 hours' ageing *in vitro* at room temperature and the latter 96 but not 120.

Notwithstanding their differential host ranges, the similarity of the symptoms induced by the two viruses on tobacco, peas, and red clover, and of their physical properties, points to their identification as strains of a single virus, probably that of lucerne mosaic [ibid., xv, p. 274].

Keil (H. L.) & Howard (F. L.). **Previewing new materials for the control of turf diseases.**—*Greenk. Reptr*, xiv, 2, pp. 22, 34, 1946.

Every year over 100 specially synthesized chemical products are tested in the laboratory and in replicated field plots at the Rhode Island Agricultural Experiment Station for their fungicidal efficiency under all weather conditions and toxicity to plants. To date, the most promising compounds for the control of large brown patch (*Corticium vagum*) [*C. solani*] on creeping bent [*Agrostis stolonifera*] and other turf grasses [*R.A.M.*, xxiv, p. 232] are zerlate [zinc dimethyl dithiocarbamate: see below, p. 415], puraturf, thiosan (now known as tersan), and calo-clor; the last-named, however, may cause considerable burning in hot weather. Tersan, puraturf, and calo-clor are the most effective preventives of dollar spot (*Sclerotinia homoeocarpa*), while the incidence of copper spot (*Gloeocercospora* [*Ramulispora*] *sorghi*) [see above, p. 392] was reduced from 24 to less than 1 per cent. by puratized 177 and puraturf and 63 per cent. by zerlate 40 days after treatment, the corresponding figures at two months being 6, 1, and 15 per cent., respectively.

Trotter (A.). **La 'nebbia' del Carrubo nella Sicilia meridionale (Oidium ceratoniae Comes).** [Carob mildew in southern Sicily (*Oidium ceratoniae* Comes).] — *Ric. Ossvz. Divulg. fitopat. Campania ed Mezzogiorno* (*Portici*), ix, pp. 1–16, 1 pl., 1 fig., 1942. [Received April, 1946.]

In view of the annual recurrence in the Ragusa province of Sicily of mildew (*Oidium ceratoniae*) of carob trees [*Ceratonia siliqua*] the author gives a more detailed account of a severe outbreak in 1927 [*R.A.M.*, vii, p. 557]. Although three

organisms, *O. ceratoniae*, *Pestalozzia curta*, and a *Phyllosticta* species [? *P. ceratoniae*] were associated with the leaf spots characteristic of the disease, the author considers that it was clearly due to the first-named fungus, as was shown by fresh infections. It is considered, however, that the local soil, climatic, and cultural conditions were predisposing factors, especially as carob trees in the other parts of the island appear to be immune from mildew.

Daines (R. H.) & Hopperstead (S. L.). **Experiments with new organic fungicides for the control of Apple scab and Brooks' fruit spot (Phoma pomi).**—*Phytopathology*, xxxvi, 3, pp. 236–237, 1946.

Comparative apple-scab [*Venturia inaequalis*] control experiments were carried out in 1944 on the Red Delicious and Rome varieties in Delaware and on the latter only in New Jersey. In the Delaware series, U.S.R. No. 604 (2,3-dichloro-1,4-naphthoquinone) [see above, p. 390] at 1 and 1½ lb. per 100 gals. and puratized N5-X (phenyl mercuri triethanol ammonium lactate) [*R.A.M.*, xxiv, p. 327 *et passim*] at 1 in 1,000 and 1 in 2,000 were equally effective with lime-sulphur (1½ gals. per 100 gals. water) in combating scab. Fermate 1½ and 2 lb. per 100 gals., the same at ½ lb. plus half the recommended quantity of micronized sulphur, No. 604 at ¾ lb. or at ⅜ lb. plus zinc sulphate-lime (½ : ¼), and isothan Q 15 (lauryl isoquinolinum bromide) [loc. cit.] were comparable to the standard wettable sulphurs in affording protection from the pathogen. He 175 (disodium diethylene bisdithiocarbamate) [also known as dithane], 0·5 to 1·8 lb. per 100 gals., either alone or in combination with zinc sulphate-lime, failed to confer adequate protection against scab.

Similar results were obtained in New Jersey, except that No. 604 at 1 lb. and isothan Q 15 fell to slightly below the efficiency of a wettable sulphur.

In a test on Rome trees in Delaware to compare the relative eradicant values of puratized N5-X and lime-sulphur, the former at 1 in 1,000 and 1 in 2,000 was at least equally effective in this respect with the latter, the incidence of infection on the fruits in the puratized N5-X, lime-sulphur, and unsprayed plots being 9·5 and 10·5, 17, and 97 per cent., respectively.

In three years' experiments in New Jersey on Staymans, tetramethyl thiuram-disulphide (thiosan) at ¾ lb. per 100 gals., fermate at ¾ lb., and lead dimethyl dithiocarbamate at ¾ lb. gave excellent control of *Phoma pomi* [ibid., xvii, p. 465], when applied 17, 27, and 37 days after petal-fall. In one out of the three years (1943), a combination of fermate and lime in the early cover-spray period was more productive of russeting than was the former material alone. Oil used in conjunction with No. 604 caused excessive injury, but its addition to puratized N5-X, isothan Q 15, and He 175 in 1945 did not increase the damage to foliage or fruits. Rome apples in Delaware also suffered severely from a mixture of No. 604 and oil.

Barthelet (J.). **Recherches sur quelques parasites des arbres fruitiers.** [Researches on some parasites of fruit trees.]—*Ann. Épiphyt.*, N.S., ix, 1, pp. 27–45, 12 figs., 1943. [Received April, 1946.]

During 1937, the author received samples of Reinette du Canada apples from the Pyrénées-Orientales showing infection by *Coryneum foliicolum* [*R.A.M.*, iii, p. 402; x, pp. 227, 676]. In October and December, 1940, the fungus was twice isolated from apples from the Ain on sale at Antibes and observed again in 1941 on apples from the Basses-Alpes which had become mummified as a result of insect attack. On fruits, the fungus would seem to be confined to rather cold, humid localities of medium elevation. Infected fruits usually show no outward lesion; internally a brown area surrounds the pericarp, as if over-ripe. This zone spreads towards the periphery, and when the remaining layer of healthy tissues becomes sufficiently thin, the fruit breaks under light pressure. At 16° C., this process takes

about 20 days. The lesion appears to arise at the point of insertion of the pedicel. Inoculations under the epidermis of fruits with fragments of a pure culture resulted in rapid infection at 20°.

Canker of pear branches of the Duchesse d'Angoulême and Beurré Giffard varieties due to *Phacidiella discolor* was noted in the same orchards where fruits had been affected in 1933 [ibid., xiii, p. 585; xvi, p. 690], in the vicinity of the Seine-et-Oise. The disease was also found near Suresnes and at Fontainebleau.

Spotted apples from the Val de Loire showed the presence of a *Diaporthe* which in culture gave pycnidia with spores, 7 to 9 by 2·5 to 3·5 μ, and later perithecia with necks 1·25 to 1·4 μ long, and numerous asci, 50 to 60 by 5 to 6 μ, with eight biseriate, two-celled ascospores, 12 to 13 by 3 μ.

Pears received in 1935 showed the presence of the fructifications of a fungus tentatively identified from pure cultures bearing two types of conidia as *Phomopsis mali* [*D. perniciosa*].

Guyomard (L.). **Sur le mode de contamination du Poirier par les conidies de Venturia pirina Aderhold.** [On the mode of contamination of the Pear by the conidia of *Venturia pirina* Aderhold.] –*C.R. Acad. Sci., Paris*, ccxx, 24, pp. 858–860, 1945.

The writer's observations in 1945 on 15 pear varieties in the Saint Brieuc region of Brittany revealed the presence of opening pustules of the scab fungus (*Venturia pirina*) on one-year-old Doyenne du Comice branches on 4th February. On the 25th pustules were detected containing both *V. pirina* conidia and conidiophore-bearing stromata of *Nectria ditissima* [*N. galligena*: *R.A.M.*, ii, p. 318]. Perithecia were recognized on 25th March on the dead over-wintered foliage, and the first discharge of ascospores occurred on 26th April.

The interest of these data in relation to local spraying practices is evident. G. Chalaud (*C. R. Congr. Pomme Bretagne*, p. 56, 1944) states that the apple scab (*V.* [*inaequalis*]) ascospore discharge period in Brittany extends from 1st to 10th May, and considers the first application of the spring spraying schedule (invariably subsequent to the latter date) to be fixed too late in the season. A similar criticism may now be made in respect of pear scab, an initial strong treatment against which should be given during the first week in February, followed by weaker applications to suppress the germinating conidia which play an important part in the pathogenesis of the disease.

Schad (C.). **Possibilité d'organiser un service d'avertissements contre la tavelure du Pommier et du Poirier.** [The possibility of organizing a spray-warning service against Apple and Pear scab.]—*Ann. Épiphyt.*, N.S., ix, 1, pp. 11–17, 1943. [Received April, 1946.]

After discussing, with numerous references to the relevant literature, the relation of weather conditions to perithecial development and maturity, ascospore liberation, conidial dissemination, and resultant infection by apple and pear scab [*Venturia inaequalis* and *V. pirina*, respectively], the author concludes that treatments must be based on a knowledge of ascospore spread, the technique employed for ascertaining the intensity of ascospore liberation, and the period when it is most likely to occur being described [see preceding abstract].

Young potted trees placed in the orchards during the infection period and then transferred to the greenhouse (at 17° to 18° C.) develop leaf scabs 8 to 15 days before the orchard trees. By this means infection can be judged in advance.

Because of the non-parallelism between perithecial maturity and apple and pear growth, the trees may be attacked at any time in different years between pre-bud-burst and the end of flowering. Hence, treatments based on the stages of development of the trees cannot, however numerous, ensure complete protection. As the ascospores and conidia are not widely dispersed, the most effective treatments

are those which afford protection against the first infections. In the absence of the 'blue' treatment [*R.A.M.*, xvii, p. 375], one or two applications of very alkaline (1 per cent.) Bordeaux mixture, timed according to ascospore emission, suffice to give adequate control.

It is recommended that the spray-warning service already organized in the central region should be extended.

English (H.) & Gerhardt (F.). **The effect of ultraviolet radiation on the viability of fungus spores and on the development of decay in sweet Cherries.**—*Phytopathology*, xxxvi, 2, pp. 100–111, 1 fig., 1946.

The writers conducted experiments to ascertain the effect of ultra-violet radiation of wave-length 2,537 Å from 30-watt 'Uviarc' lamps on the spores of seven pathogens of Bing and Lambert sweet cherries in the State of Washington, namely *Alternaria* sp., *Botrytis cinerea*, *Cladosporium herbarum*, *Penicillium expansum*, *Pullularia* sp., *Rhizopus* sp., and *Sclerotinia fructicola* (*Monilia* stage), and on the development of decay in the fruits [*R.A.M.*, xxv, p. 124].

Treatment of spores sown on nutrient agar showed that most of those of *Penicillium expansum* succumbed to a 30-second exposure, whereas five minutes' irradiation destroyed only a few of the *Alternaria* conidia. Slightly over half the *Pullularia* and *S. fructicola* spores were killed in 2½ minutes, but a five-minute exposure was necessary to secure a comparable reduction in the viability of *C. herbarum* conidia. Attention has been drawn by previous workers to the greater resistance of dark spores to ultra-violet rays [ibid., viii, p. 516; xx, p. 219]. Colony formation by the surviving irradiated spores was noticeably retarded.

The viable spores in scrapings from the conveyor belt in a commercial sweet cherry packing plant were somewhat reduced by exposure to ultra-violet light, and it seems probable that a 45-minute treatment would kill the bulk of the inoculum; however, the number of living air-borne spores in an irradiated section of the packing room was not significantly smaller than that in a non-radiated part and it is thought that re-infection by air-borne spores would nullify any ray treatment.

Blue mould (*Penicillium expansum*) decay in artificially wounded and inoculated cherries was not reduced by irradiation, nor did the treatment arrest the process of natural rotting even when the exposure period was extended to ten minutes, or 40 times that employed commercially (25 seconds). As applied in these investigations, therefore, the ultra-violet light treatment seems to afford no prospect of combating decay in sweet cherries, whereas the maintenance of proper storage and transit temperatures definitely minimizes the losses from this source [ibid., xxi, p. 532].

Böhni (Erika). **Die Überwinterung des Erregers der Bitterfäule.** [The overwintering of the agent of bitter rot.]—*Experientia*, ii, 6, pp. 224–225, 4 figs., 1946. [English summary.]

Gloeosporium fructigenum [*Glomerella cingulata*], the agent of bitter rot of cherries, and more rarely of apples and plums in Switzerland, assumed an epidemic character in 1939, since when it has caused annual reductions in the cherry crop estimated at 50 to 70 per cent. The mycelium has been found to overwinter in a parasitic form in the bud scales, as well as in the twigs.

Buchwald (N. F.). **Paavisning af Monilinia (Sclerotinia) fructigena (Aderh. et Ruhl.) Honey paa Hasselnød (Corylus avellana).** [Confirmation of *Monilinia* (*Sclerotinia*) *fructigena* (Aderh. & Ruhl.) Honey on Hazel-Nut (*Corylus avellana*).]—*Tidsskr. Planteavl*, xlvii, 3, pp. 521–538, 5 figs., 1943. [English summary. Received June, 1946.]

The author's study of the *Sclerotinia* attacking hazel-nuts (*Corylus avellana*) in Denmark [*R.A.M.*, xvi, p. 86] and elsewhere was undertaken to settle the existing divergences of opinion regarding its specific identity [ibid., xxv, p. 36].

Victoria plums and Heynichs Zeller hazel-nuts, some picked and others still on the trees, were inoculated with the organisms from both hosts and developed identical symptoms. Mycelial and monospore isolates from the infected hazel-nut material corresponded in cultural characters with those of *S. fructigena* [ibid., xxiii, p. 136; xxiv, p. 157] and there were no differences in the dimensions of the conidia from the two hosts. In both cases identity with *S. fructigena* was established by calculations of the ratio between the mean length (approximately 20 μ) and breadth (10 μ), viz., 2 : 1, compared with 3 : 2 for *S. laxa* from plums. The host range of the former species, hitherto known only to comprise members of the Pomaceae and Amygdalaceae, is thus enlarged to include the hazel-nut.

Schellenberg's attribution of his hazel-nut pathogen to *S. coryli* (*Ber. dtsch. bot. Ges.*, xxiv, pp. 505–511, 1906) cannot be accepted in the light of subsequent studies, and the substitution of the name *Ciboria coryli* (Schellenb.) n. comb. [cf. *R.A.M.*, Suppl. 10, p. 135] is accordingly proposed.

Jenny (J.). **Die stationären Spritzanlagen.** [Stationary spraying outfits.]—*Schweiz. Z. Obst- u. Weinb.*, lv, 13, pp. 256–260, 2 figs., 1 diag., 1946.

Particulars are given of recent improvements in the construction, manipulation, and other features of Swiss spraying outfits for the orchard and vineyard [cf. *R.A.M.*, xxi, p. 183] necessitated by the intensification of plant-protective operations during recent years.

Carrière (E.). **Production of cuprous anticryptogamic mixtures from copper and its alloys.**—*Chim. et Industr.*, l, pp. 68–69, 1943. [French. Abs. in *Chem. Abstr.*, xl, 10, p. 2919, 1946.]

The most economical method of producing cuprous plant-protectives is said to have been found at the University of Montpellier, France, to consist in the electrolysis of sodium chloride solution (20 per cent.) by means of electrodes of copper or one of its alloys, e.g., brass, bronze, or German silver, with stirring of the electrolyte. Two copper electrodes are used, which are attacked alternately to obviate polarization. The process described yields products comparable to Bordeaux mixture [cf. next abstract], i.e., brass gives copper hydroxide and zinc hydroxide, bronze, copper hydroxide and stannous hydroxide, and German silver, copper hydroxide, stannous hydroxide, and nickel hydroxide.

Carrière (E.). **New outlooks for the anticryptogamic industry.**—*Chim. et Industr.*, lii, pp. 127–129, 1944. [French. Abs. in *Chem. Abstr.*, xl, 10, p. 2919, 1946.]

This is a discussion of changes demanded by modern practice in the plant-protective industry [see preceding abstract]. Copper hydroxide, already on the market under the name of 'Sandoz copper' [*R.A.M.*, xxiv, p. 153], containing a wetting agent to hold it in suspension, should be substituted for Bordeaux as the most economical form of copper. Aluminium oxide gel is an ideal adhesive for such products, with the added advantage of its own inherent toxicity. Alkali sulphur salts should replace elemental sulphur, which is very wasteful.

Wellman (R. H.) & McCallan (S. E. A.). **Glyoxalidine derivatives as foliage fungicides. I. Laboratory studies.**—*Contr. Boyce Thompson Inst.*, xiv, 3, pp. 151–160, 2 graphs, 1946.

Laboratory tests [cf. next abstract] with derivatives of the glyoxalidine or imidazoline nucleus as fungicidal agents against *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, and *Macrosporium sarcinaeforme* [*Stemphylium sarciniforme*], using the slide-germination method [*R.A.M.*, xxiii, pp. 34, 35] for determining the fungistatic LD_{50} values, showed that maximum fungistatic action is obtained with derivatives possessing a straight chain substituent containing 13 to 17 carbon atoms in the 2-position. Fungistatic action was not reduced by combination

with acid lead arsenate or summer oil. Maximum toxicity to plants using Bountiful beans (*Phaseolus vulgaris*), buckwheat, and tobacco in the greenhouse is attained with the 11- to 13-carbon atom derivatives. The ratio of highest non-phytotoxic concentration to LD_{50} value for 1-hydroxyethyl-2-undecylglyoxalidine is 13·5 and for 1-hydroxyethyl-2-heptadecylglyoxalidine 1450. Side-chain unsaturation increased phytotoxicity, as also does increasing length of chain in the 1-position. In the greenhouse these materials were harmful to tomatoes at concentrations too low to control early (*A. solani*) and late [*Phytophthora infestans*] blights, and gave only moderate control of snapdragon [*Antirrhinum majus*] rust [*Puccinia antirrhini*] without harm to the plants.

Thurston (H. W.), Harry (J. B.), Lewis (F. H.), Groves (A. B.), & Taylor (C. F.). **Glyoxalidine derivatives as foliage fungicides. II. Field studies.**—*Contr. Boyce Thompson Inst.*, xiv, 3, pp. 161–171, 1 fig., 1 graph, 1946.

The results are presented of field tests over several years for the control of black spot of rose (*Diplocarpon rosae*), apple scab (*Venturia inaequalis*) and rust (*Gymnosporangium juniperi-virginianae*), late blight of potato (*Phytophthora infestans*), and cherry leaf spot (*Coccomyces hiemalis*), with three glyoxalidine derivatives, already proved effective in laboratory tests [see preceding abstract], 1-hydroxyethyl-2-heptadecylglyoxalidine (No. 337), 2-heptadecylglyoxalidine (No. 341), and 1-aminoethyl-2-heptadecylglyoxalidine (No. 630). In one year's test on roses var. World's Fair, 337 and 341 at 3 lb. per 100 gals. gave control of black spot equivalent to Bordeaux mixture with a wetting agent, the deposit being less conspicuous, although 337 was less effective and rather phytotoxic. In five years' tests of 337 and 630 at 3 lb. and 341 at 1 lb. per 100 gals. against apple scab, using varieties McIntosh and Stayman, control was obtained equivalent to standard lime-sulphur and considerably better than fermate at 3 lb. At 3 lb. per 100 gals. 337 proved phytotoxic, while at 1 lb. per 100 gals. 341 gave healthier foliage and a larger leaf area per fruit spur than standard lime-sulphur and the residual effect in controlling *V. inaequalis* on the foliage was considerable. Glyoxalidine derivatives have much steeper dosage response slopes than fermate in the field. Fermate gave better control of cedar-apple rust on varieties Rome and York than 337. Acid lead arsenate, nicotine sulphate, excess hydrated lime, and summer oil were found to be compatible in combination with the latter derivative. The glyoxalidine derivatives confirmed laboratory tests in their toxicity to potato leaves and failure to control *P. infestans*. In four years' tests in Pennsylvania and Virginia and two years' tests in West Virginia, 337 at 1 lb. per 100 gals. gave the best control of leaf-spot defoliation of sour cherries var. Montmorency and little or no leaf injury was caused and no dwarfing of the fruit.

Stewart (W. D.) & Standen (J. H.). **Polymeric organic polysulphides as fungicides and spray adjuvants.**—*Contr. Boyce Thompson Inst.*, xiv, 3, pp. 203–220, 3 figs., 1946.

Polyethylene pentasulphide is prepared cheaply by condensing ethylene dichloride and sodium pentasulphide using inexpensive raw materials, and is considered the most feasible, economically, of the organic polysulphides to produce commercially. These researches have solved some of the difficulties long experienced in producing for commercial use polymeric organic polysulphides of fine molecular particularity (ranging in the case of polyethylene pentasulphide to 1 to 4 μ), stability, adhesive power, and embodying, moreover, labile, active, sulphur atoms non-volatile in hot weather and, therefore, non-phytotoxic.

Dispersed on plants with a modern spray unit, fitted with a single gun, developing 350 to 400 lb. pressure, polyethylene pentasulphide forms stable, translucent latices which dehydrate to form rubber-like films, insoluble in water and oil, of

unusual tenacity and weather resistance, and these latter properties are imparted to the deposit of other spray materials with which it may be combined.

Slide-germination tests demonstrated that polymers of polyethylene polysulphides displayed almost equal toxicity to both *Sclerotinia fructicola* and *Alternaria solani* (fungicidal activity rising with increases in the sulphur content).

These experiments also showed that fungicidal activity is associated with the solid or polymer phase of the latices, the aqueous phase being almost non-toxic. Field experiments in 1945 with polyethylene pentasulphide showed that it gave good control at 2 lb. per 100 gals. of *Venturia inaequalis* in conditions of heavy and frequent rainfall; heavy scab infection in a 15-year-old orchard of Rome, McIntosh, Red Delicious, and Golden Delicious varieties was eliminated. Roses, which are highly susceptible to spray injury, were satisfactorily treated at 1 per cent. concentration of the fungicide for infection by *Sphaerotheca humuli* and slightly affected leaves regained their colour. Concentrations of 0·25 per cent. were sprayed on specified varieties of potato, tomato, eggplant, bean (*Phaseolus vulgaris*), beet, turnip, and onion in the field without damage to the plants.

The adhesive properties of polymeric organic polysulphides and the rubber-like properties of polymer are conjoined. The latices show excellent physical compatibility in combination with standard insecticides, fungicides, and spray adjuvants when tank-mixed, and increase their toxicity, but if added to dusts before wetting, or to alcoholic solutions and similar dehydrating agents before dilution, they lose their stability. Should slightly toxic materials be mixed with polyethylene polysulphide the latter's capacity to increase this phytotoxicity, by virtue of its high retentive power and resistance to removal by rain, might cause serious damage to plants, for example, were it used in combination with lead arsenate at 4 lb. per 100 gals. An unpublished paper by S. L. Hopperstead of the Plant Pathology Department of Delaware University records more effective control of *V. inaequalis* by Bordeaux mixture, isothan Q 15, and fermate used in association with polyethylene pentasulphide, the most satisfactory combination being with isothan Q 15. The polymer alone at 0·25 per cent. gave better control than fermate at one lb. per 100 gals. of water.

Marchionatto (J. B.). **Reseña de la sanidad vegetal en la República Argentina.** [A review of plant health in the Argentine Republic.]—*Publ. Fac. Agron. B. Aires* 2, 117 pp., 19 figs., 2 diags., 1946. [English and Portuguese summaries.]

Many of the papers referred to in the course of this review of mycological and phytopathological developments in Argentina from the early years of the nineteenth century to 1943 have been noticed from the original sources. The past and present organization and functions of the plant health services under the Ministry of Agriculture are also described [*R.A.M.*, xv, p. 272; xxiv, p. 28].

Smolák (J.). **Rostlinná Pathologie.** [Plant pathology.]—4th revised edition, 388 pp., 1 col. pl., 279 figs., Prague, Česká grafická Unie a.s., 1946. Za Kčs 100.

This fourth edition of the author's text-book on plant diseases, their prevention and control [*R.A.M.*, vi, p. 243], incorporates advances made in the various branches of phytopathology since 1926 and has particular value as supplying a modern text-book to students and workers at a time of agricultural reconstruction after the war. There is a bibliography of 101 titles and a full index.

Dillon Weston (W. A. R.). **Bean rot. Powdery mildew of cereals. Apple scab.**—*J. Minist. Agric.*, lii, 9, pp. 425–426, 1 fig., 1945; 11, pp. 522–524, 1 fig.; 12, pp. 551–553, 1 fig., 1946.

These are popular accounts of bean rot (*Sclerotinia trifoliorum*), powdery mildew of wheat, barley, oats, rye, and grasses (*Erysiphe graminis*), and apple scab

(*Venturia inaequalis*), illustrated as in the earlier contributions [*R.A.M.*, xxiv, p. 105] by charts. Appropriate methods of control are indicated.

WOLFENBARGER (D. O.). **Dispersion of small organisms. Distance dispersion rates of bacteria, spores, seeds, pollen, and insects : incidence rates of diseases and injuries.**—*Amer. Midl. Nat.*, xxxv, 1, pp. 1–152, 181 graphs, 1946.

Following a brief introduction and discussion of terms and methods, the author in part I of this comprehensive treatise surveys the evidence available in the literature of dispersion and incidence rates for horizontal and vertical dispersions in the various groups of the animal and vegetable kingdoms as well as for such inanimate objects as splashes and balloons. Using methods described by Wadley and Wolfenbarger (*J. agric. Res.*, lxix, pp. 299–308, 1944), the data from published papers have been plotted as curves with distances from the source as abscissae and numbers or percentage increases as ordinates, such regression curves being used to compare the dispersions of the various fungi, bacteria, viruses, insects, etc., discussed.

Part II, comprising 24 pages and entitled generalizations, analyses the foregoing data, with deductions and recommendations for future trends of research, under the headings of distance, direction of dispersion, factors influencing dispersion, migration of small organisms, agencies or means of dispersion, density levels at the source, sampling characteristics, dispersions for control measures, considerations of vertical and horizontal dispersion, vertical dispersion generalizations, and vertical strata. Only a few of the points discussed can be noticed here. The distances dispersed by organisms depend on their character and activity. Field records show a remarkable consistency as regards rate of dispersion. Direction also depends on character and activity and is modified by locality. For spores [*R.A.M.*, xxiv, p. 374], even when wind-borne, dispersion appears to be omnidirectional, though this may hold for short distances only, long-distance dispersion being unidirectional. Factors both internal and external will affect not only distance and direction but also initiation and termination of dispersion activity. Density level at the source appears to determine the ultimate extent of spread even in the case of spores where active competition is not operative. Sampling characteristics show that methods should take into account, among other things, time and locus of origin, which may be centralized or non-centralized: in the latter case tangential as well as radial dispersion must be considered. These studies will aid control measures by providing essential information, e.g., the area over which control should extend to be effective and beyond which it would be unnecessary or uneconomical to continue it. Vertical distribution records show that while most dispersion occurs probably near the ground, *circa* 25 ft., bacteria and fungi have been found abundantly at 12,000 to 16,000 ft. With increased altitude factors affecting viability must be considered. An optimal dispersion stratum for each disseminule is considered possible. A nine-page bibliography is given.

WILSON (E. E.) & BAKER (G. A.). **Some aspects of the aerial dissemination of spores with special reference to conidia of Sclerotinia laxa.**—*J. agric. Res.*, lxxii, 9, pp. 301–327, 2 figs., 2 diags., 1 graph, 1946.

The increasing interest in the aerial dissemination of fungal spores [see preceding extract] is shown in this paper, which is fully tabulated and supplied with a list of 20 references to books and papers on various aspects of the subject.

The adaption of the conidia of *Sclerotinia laxa* [*R.A.M.*, xxi, p. 420] to wind dissemination was studied by measuring their rate of fall in still air from which it was calculated that if they were released at a height of 6 ft. they would be carried 3,770 ft. by a 5 m.p.h. wind before settling on the ground. In the Sacramento Valley large blocks of apricot trees, satisfactorily treated in January with mono-

calcium arsenite, were invariably infected abundantly by air-borne conidia from infected trees near by. The spread of disease northwards in these orchards by conidia from these sources was demonstrated by the figures for average incidence of blossom infection in trees 22, 44, 66, and 88 ft. from the nearest source trees which were in 1939, 39, 21, 12, and 6·5 per cent., respectively, of the level in source trees, and in 1940 55·5, 40, 28, and 23 per cent. It was noted that in both years there was only one period at the susceptible, blossoming stage when the direction of the wind favoured spore dissemination northwards from the source; but during this time the wind velocities in 1940 were 1·88 times higher than during the 1939 period.

To test the variation in aerial density of spores as distance from the source increased, *Lycopodium* spores were released and caught on glass slides placed 5, 10, and 15 ft. downwind from the point of release, the number of spores traversing a unit area of intercepting planes varying approximately in inverse proportion to the square of the distance from the source—a result to be expected if spore dispersion is described by a horizontal cone having its apex at the source of the spores and its base oriented to the average direction of the wind. The density of the spores was seen to be greatest in the centre of the plane at release level and decreased progressively above and below and to right and left of the centre, which also accords with normal probability. The degree of dispersion at various distances from the source was expressed, therefore, by taking the standard deviations of the distributions which increased in proportion to the distance from the source. The standard deviations for horizontal dispersions (designated as σ_h) were invariably greater than those for vertical dispersions (σ_v) at similar distances. A mean ratio of these two terms was found to be 1·55 when spores were discharged 7·5 ft. from the ground, corresponding closely to the figure of 1·59 recorded in measuring the amplitude of the horizontal and vertical components of turbulence with a bi-directional wind vane, placed 6·56 ft. from the ground. These results were confirmed by studies of dispersals of ammonium chloride 'smoke'.

Dispersal was found to be wider among leafless trees than in the open in the same wind. The wind velocity was decreased by the trees. Variations in wind velocity between 2 and 16 miles per hour did not appear to influence the rate at which aerial density of spores decreased with increasing distances from the source, but dispersion at a given distance from the source was often greater in the case of low-velocity winds than for those of medium and high velocity. Between medium and high velocities dispersion varied little within 5 to 15 ft.

The degree of dispersion at a given distance from the source depends on how fast the spores are dispersed in relation to the rate of their passage downwind. Indeed, with a limited source, spore dispersion at a given distance will probably decrease as wind velocity increases, unless the effects of turbulence on dispersion increase as fast as wind velocity, or faster. At present the general conclusion would appear to be that dispersion increases *pari passu* with velocity, except below about 5 m.p.h. The desirability of studying dispersal at greater distances from the source is indicated.

A generalization is attempted by comparing the spread of *S. laxa* with the results of these experiments for dispersal (1) from a three-dimensional block source instead of from a 'point' source, (2) through orchard trees instead of over open ground, and (3) for distances up to 100 instead of 15 ft. Disease dissemination through the apricot orchards is thought to be represented approximately by $y = \frac{A}{x^p}$ where y is the ratio of the percentage of blossom infection in a vertical section of susceptible (blossom) tissue at a horizontal distance from the source block to the percentage of blossom infection in the source trees, A and p are constants depending on wind velocity and possibly on other quantities to a lesser extent, and x is the horizontal distance from the centre of the nearest source trees.

Carvajal (F.). **A superior pith for free-hand sections.**—*Science*, N.S., ciii, 2665, p. 112, 1946.

Satisfactory results have been obtained with the dry pith of *Tetrapanax papyriferum* stalks in the sectioning of plant material. The pith is extractable from the dead stalks during the winter in rods of 1 m. or more in length and 1·5 cm. in diameter.

Tapke (V. F.). **A rapid method for isolating single ascospores from apothecia.**—*Phytopathology*, xxxvi, 2, pp. 167–168, 1946.

A simple and rapid method for the isolation of single ascospores from apothecia consists in the immersion of the lower two-thirds of the apothecium in 95 per cent. alcohol, which causes the immediate ejection of a cloud of ascospores. Three Petri dishes containing nutrient agar are placed near the vial, which should exceed the fruiting body only slightly in height and diameter, and opened in the cloud in quick succession. The last plate usually catches only a few spores in perfect position for isolation and quite free from contaminants. Very small apothecia were held face downward over the nutrient agar and rubbed with a needle moistened with alcohol.

McCallan (S. E. A.). **Outstanding diseases of agricultural crops and uses of fungicides in the United States.**—*Contr. Boyce Thompson Inst.*, xiv, 3, pp. 105–115, 1946.

A method is devised for assessing the national economic importance of losses from disease sustained by the main agricultural crops of the United States by means of an index obtained from the product of the logarithm of estimated annual loss per cent. (from *Plant Dis. Reptr Suppl.*, 1928–1939) and that of the farm value expressed in units of $100,000. The average losses for the ten-year period 1930–1939 were thus obtained and those with indices of 1 or more were regarded as outstanding diseases. The author points out that this method does not distinguish between diseases which are constantly present every year and those which are epiphytotic. Tables record the 50 leading crops, with the farm value, acreage, and farm value per acre, together with the five chief producing States; the 36 principal diseases ranked according to the index with the average annual percentage loss which they cause based on a decennial range of fluctuation, and the conventional measures for their control; and the annual cost of fungicidal chemicals and the percentage employed per crop in combating the main diseases. Maize root rot (*Diplodia zeae*), stalk rot (*Gibberella zeae*), and ear rot (*Fusarium moniliforme*) [*G. fujikuroi*], seedling blight and boll rot of cotton (*Glomerella gossypii*, *Fusarium* spp., *Rhizoctonia* [*Corticium*] *solani*, *Sclerotium bataticola* [*Macrophomina phaseoli*], *D. gossypina*, etc.), and apple scab (*Venturia inaequalis*) are most prominent among the diseases listed. Seed treatment as a method of control in maize diseases is thought likely to be limited to the seedling blight stage, but more efficient fungicides for seed treatment of maize and cotton and better and improved laboratory and greenhouse techniques for the speedy appraisal of such chemicals are clearly shown to be essential. A more thorough fruit and foliage fungicide or combined fungicide-insecticide is demanded for the control of *V. inaequalis*, and the greenhouse assessment method of Hamilton and Weaver (*Phytopathology*, xxx, 1, p. 7, 1940) requires further development for large-scale testing. A fungicide, or combination of sprays, to control diseases (notably *Phytophthora infestans*) and pests of potato is needed, although Bordeaux mixture will not be easily replaced; and mention is made of the author and Wellman's method [*R.A.M.*, xxiii, p. 34] for rapid testing of fungicides against this disease. Better seed treatments or wider use of existing ones seem desirable if the control of *Ustilago avenae* and *U. levis* [*U. kolleri*] is to become as effective as that of wheat bunt [*Tilletia caries* and *T. foetida*]. A better foliar fungicide is needed against brown rot (*Sclerotinia fructicola*) of peaches and

cherries, the most common organism used in the standard laboratory slide-germination method of testing fungicides [ibid., xxii, p. 489]. Fireblight (*Erwinia amylovora*), the most serious bacterial disease of pears and apples, still awaits more effective methods of control. Nor are copper sprays and dusts thoroughly satisfactory for the control of early (*Alternaria solani*) and *Septoria* (*S. lycopersici*) blights of tomato [ibid., xxiii, p. 34]. Better fungicides should improve the control of groundnut leaf spot [*Cercospora arachidicola* and *C. personata*] on which large quantities of sulphur are used. It is noted that chemical fungicides are unlikely, in the light of present knowledge, to control virus and vascular wilt diseases successfully.

It is considered that a fungicide assessment method evolved for one pathogen might well prove adaptable to a group of similar diseases. Thus, an effective control of tomato late blight [*P. infestans*] might be serviceable for other downy mildews and that of wheat bunt or the covered and loose smuts for all smuts arising from seedling infections.

Neergaard (P.). **Sprøjtning af Frugttræer, Frugtbuske, Køkkenurter og Blomster og anden Bekæmpelse af Havens Sygdomme og Skadedyr.** [Spraying of fruit trees, fruit bushes, kitchen-garden plants, and flowers, and other methods of combating garden diseases and pests.] –86 pp., 58 figs., Copenhagen, J. F. Clausens Forlag, 1944. [Received June, 1946.]

This second, greatly amplified edition of the author's practical guide to the direct and indirect control of horticultural diseases and pests in Denmark comprises an introductory chapter on the economics of treatment; an alphabetical list of hosts and their well-known pathogens; schedules for winter and summer spraying; lists of standard fungicides and insecticides and of the different types of apparatus with their uses; precautions against nicotine, arsenic, and copper poisoning; supplementary cultural measures, including the choice of resistant varieties, soil amendments, crop rotations, and the treatment of various mineral deficiencies, to which a key is supplied; virus diseases; hygiene; storage diseases of fruits and vegetables; references to useful literature; and a concluding note on the Danish advisory institutes and their functions.

Chilton (S. J. P.), Lucas (G. B.), & Edgerton (C. W.). **Genetics of Glomerella. III. Crosses with a conidial strain.**—*Amer. J. Bot.*, xxxii, 9, pp. 549–554, 2 figs., 1 diag., 1946.

From crosses between a non-perithecia-producing conidial strain, previously called [*R.A.M.*, xxiii, p. 395] the heavy conidial strain derived from a plus strain of an unidentified species of *Glomerella* from *Ipomoea*, and strains of the plus and minus types, perithecia developed slowly in the crosses with the plus strain and more rapidly in those with the minus strains. Among the progeny derived from the ascospores from the crosses two additional conidial strains were obtained. The possible genetical make-up of the strains is deduced from the various crosses.

Stice (Edith) & Pratt (R.). **Production of penicillin X in 'submerged' surface cultures.**—*Science*, N.S., ciii, 2678, pp. 535–537, 1 diag., 1 graph, 1946.

A description is given of the construction and application of an apparatus which permits a continuous production of penicillin X for several weeks without resterilization or reinoculation.

Liggett (R. W.). **The use of Corn steeping liquor in microbiological research.**—Abs. in *J. Bact.*, li, 5, p. 597, 1946.

Maize steeping liquor, a valuable nutritive material formerly known to the trade as 'yeast compound' and now used in penicillin fermentation [*R.A.M.*, xxv,

p. 352 and next abstracts], is an extract of maize solubles under acid conditions (P_H 4 to 4·5) in the presence of dilute sulphurous and lactic acids. Laboratory studies showed that during processing an active microbial population, chiefly lactic acid bacteria and yeasts, assists in the extraction. It contains roughly 8 per cent. nitrogen and is high in essential amino acids and minerals and most of the B-complex vitamins. Its value in antibiotic production is at least partially due to the extensive fermentation it has undergone during the wet maize milling process. In addition to its well-established property of augmenting yields in mould fermentations it is an effective medium for many bacteria.

Pratt (R.) & Hok (K. A.). **Influence of the proportions of KH_2 PO_4, Mg SO_4, and Na NO_3 in the nutrient solution on the production of penicillin in submerged cultures.**—*Amer. J. Bot.*, xxxiii, 3, pp. 149–156, 4 diags., 1 graph, 1946.

A study was made of the accumulation of penicillin in cultures of four strains of *Penicillium chrysogenum* and two of *P.* sp. grown in 65 different nutrient solutions each containing potassium dihydrogen phosphate, magnesium sulphate, and sodium nitrate in varying proportions but each with a total molar salt concentration of 0·04 M, with the addition of 3 per cent. lactose and 2 per cent. maize steep liquor [see preceding abstract]. In general, satisfactory penicillin yields were obtained from *P. chrysogenum* X 1612 with proportions of potassium sulphate and magnesium sulphate each ranging from 10 to 40 per cent. of the total salt concentration, the corresponding figure for sodium nitrate being 20 to 80 per cent. Adjustments in the total salt concentration showed that maximum yields of penicillin could be secured at 0·16 M with the standard proportions of auxiliary nutrients but alterations in these shifted the optimum salt strength.

Foster (J. W.), Woodruff (H. B.), & McDaniel (L. E.). **Microbiological aspects of penicillin. IV. Production of penicillin in submerged cultures of Penicillium notatum.**—*J. Bact.*, li, 4, pp. 465–478, 1 graph, 1946.

The growth of suitable strains of *Penicillium notatum* in shake culture results in the rapid formation of potent penicillin broths. This method of culture has several advantages over surface growth, including the elimination of such variable factors as diffusion and pellicle formation and the acceleration of development and metabolic processes. The growth of the mould on a modified brown sugar medium may be still further expedited by the addition of crude organic supplements, e.g., maize steep liquor (the reserve acidity of which should be adjusted with sodium hydroxide, calcium carbonate, or both) [see preceding abstracts] and cottonseed meal.

Penicillin production reaches a peak after the disappearance of the sugar from the medium. Evidence is forthcoming for the existence of two factors promoting penicillin formation, one inorganic ash and the other of an organic nature. Both reside in brown sugar, and the latter at least in cottonseed meal. The maintenance of an adequate oxygen supply is of paramount importance in penicillin production in submerged culture.

Cook (R. P.) & Brown (Margaret B.). **Penicillin production on juices from various parts of the Pea plant.**—Abs. in *Bio-chem. J.*, xl, 2, pp. xxii–xxiii, 1946.

The expressed juices from various parts of green seed pea plants were added to the basal medium used by the authors and collaborators in previous investigations on penicillin production by *Penicillium notatum*. The approximate maximum yields obtained from strain 1249B 21 were as follows: haulm juice 30 units per ml., pods 70, mixed haulm and pods 70, peas in pod (Kelvedon Wonder) 175, and the same ('V/C') 100.

Duyvené de Wit (J. J.), Jaarsveld (A[lida]), Jansen (B. C. P.), Van Luyk (A.), Luyken (R.), Oosterhuis (H. K.), & Wybrans (J. R.). **De isoleering van een bactericide en fungicide stof mit een penseelschimmel.** [The isolation of a bactericidal and fungicidal substance from a 'paint-brush' fungus.]—*Ned. Tijdschr. Geneesk.*, lxxxviii, 31–32, pp. 718–719, 1944. [Received July, 1946.]

As early as 1939 A. van Luyk drew attention to the great importance of the metabolic products of micro-organisms in medicine [*R.A.M.*, xix, p. 38]. Since that time a substance isolated from *Penicillium expansum* and named 'expansine' has been shown to inhibit the growth of human pathogenic bacteria, including *Eberthella typhosa* (inhibited at dilutions of 1 in 20 to 1 in 1,000) and *Mycobacterium tuberculosis* (at 1 in 20 to 1 in 200). The filtrate of *P. expansum* was found to contain at least two and probably more antibiotic fractions, of which one suppressed the development of *Pythium mamillatum*, the agent of sugar beet root rot [ibid., x, p. 293], in a dilution of 1 in 6,000,000 but was almost innocuous to *Staphylococcus aureus*, while the other inhibited the growth of the bacterium at 1 in 100,000 but did not prevent that of the fungus. Unlike penicillin, expansine is very poisonous, a daily dose of over 1 mg. being lethal to an adult rat.

Mathieson (J.). **Antibiotics from Victorian Basidiomycetes.**—*Aust. J. exp. Biol. med. Sci.*, xxiv, 1, pp. 57–59, 1946.

Out of 230 species of Basidiomycetes collected in Victoria and tested for their antibiotic properties, 39 were active against *Staphylococcus aureus*, one against *Escherichia* [*Bacterium*] *coli*, and 20 against both these organisms [cf. *R.A.M.*, xxiv, p. 158]. The aqueous extract of an unidentified species of *Psalliota* inhibited the growth of various bacteria, the diameters of the circles of inhibition in cylinder-plate tests with cultures of *Streptococcus pyogenes*, *Staphylococcus aureus*, *Bact. coli*, *Eberthella typhosa*, and *Shigella* Flexner III being 17, 16, 17, 29, and 16 mm., respectively, a 15-mm. ring being roughly equivalent to 0·4 Oxford units per ml. penicillin. The extract is not haemolytic after Seitz filtration, nor did it prove toxic on intracerebral injection into a mouse.

Musgrave (A. J.). **Mould growth on leather.**—*Chem. & Indust., 1946*, 24, pp. 226–227, 1946.

In this paper, read before the Microbiological Panel of the Food Group, Society of Chemical Industry, on 9th January, 1946, the author gives an outline of the mycological problems of the leather industry, supplemented by references to important contributions in the relevant literature.

Proposed provisional method for testing the resistance of leather to the growth of fungi.—*J. Amer. Leath. Chem. Ass.*, xl, 6, pp. 239–240, 1945.

The following are the essential features of the provisional method developed by the Physical Testing Committee of the American Leather Chemists' Association for testing the resistance of leather to fungal contamination. At least four representative specimens, not less than 1 sq. in. in area, shall be cut from each sample, and control specimens of a leather of established susceptibility to fungal invasion included in each series of tests. The inoculum shall consist of a fungus spore mixture in sand to be furnished by the Tanners' Council Laboratory, University of Cincinnati. Half the number of specimens are to be immersed for 5 to 10 minutes in distilled water (10 : 1 ratio water to leather by weight) and the remainder shaken for three hours in 20 times their weight of water, both processes at room temperature. After inoculation with a suspension of the spore mixture (10 gm. in 100 ml. water), the specimens shall be incubated for 30 days in a dark chamber at 25° to 32° C. and a relative humidity of not less than 85 per cent., and the report on the

test shall state that the leather either (*a*) showed no mould growth during the period of observation, or (*b*) the time at which fungal growth appeared, with conventional indications of its extent.

KANAGY (J. R.), CHARLES (ARBELIA M.), ABRAMS (E.), & TENER (R. F.). **Effects of mildew on vegetable tanned strap leather.**—*J. Amer. Leath. Chem. Ass.*, xli, 5, pp. 198–213, 2 diags., 5 graphs, 1946.

Samples of vegetable-tanned strap leather were exposed to conditions favouring mildew growth in a tropical room at Fort Belvoir, Virginia, and also in soil-burial beds and in a humidity cabinet at the National Bureau of Standards, Washington, D.C. Moderate to heavy infection by *Aspergillus niger*, *A. oryzae*, *Penicillium* spp., and other organisms developed, resulting in increased stiffness, loss of tensile strength, decreased stretch at breaking-point, and weakening of the grain surface, but not in any appreciable deterioration of the hide substance. Chemical tests disclosed a loss of grease, water-solubles, glucose, tannins, and non-tannins, associated in the case of the first-named with fatty acid decomposition. Comparable samples, impregnated with a fungicidal oil having as active ingredients a mixture of para-nitrophenol and pentachlorophenol in equal parts [*R.A.M.*, xxiii, p. 401] and stored under the same conditions as the untreated leather, showed no evidence of mildew after three months.

WESTON (W. H.). **Tropical deterioration of textile products.**—*Proc. Conf. Quartermast. Text. Res., 1945*, pp. 29–39, 9 figs., 1945.

Much of the information presented in this survey of problems connected with the tropical deterioration of textiles [*R.A.M.*, xxiv, p. 427] has already been noticed from other sources. The following points may be noted. The loss of stores from mould and mildew in Ordnance Depots in India was estimated at £60,000 for the last three months of 1944 alone, a relatively dry period of the year. For determining the identity and nature of the organisms implicated in the process 137 samples of affected material, yielding a total of over 1,000 fungi, were received from 24 bases in the South and South-West Pacific theatres of war. The Quartermaster Corps (Army of the United States) maintains a collection of some 6,000 textile-destroying fungi. Cellulose-destroyers were represented in all groups; the vigour of this action is not necessarily an index of their importance, since some of the less destructive are highly important in the field because of their abundance and rapid growth. Evidence was obtained that the preliminary growth of one species of *Aspergillus* resulted in the more extensive growth later of one of the vigorous cellulose-destroyers.

Prevention and control has presented complex problems, the principal drawback to fungicidal agents being lack of resistance to rain and sunlight. Their evaluation by laboratory procedures requires checking from field tests, which takes considerable time to complete, and much of this work remains to be done. Exposure tests of treated fabrics to sunlight and to shade have been carried out chiefly in Florida and Panama. Work on fungicidal treatments is proceeding, but the development of immunity within the basic material itself, brought about by a chemical modification of the cellulosic system to render it unavailable as a carbon source of food, is regarded as a more promising field.

ST. GEORGE (R. A.) & FURRY (MARGARET S.). **The resistance of treated Cotton fabrics to attack by termites and micro-organisms.**—*Amer. Dyest. Reptr*, xxxv, 8, pp. 207–210, 1 fig., 1946.

Of 16 finishing treatments tested by the soil-suspension method for their efficacy in the protection of cotton fabric against termite attack and fungal infection [*R.A.M.*, xxiii, p. 309], the following were eminently satisfactory for both purposes;

cuprammonium hydroxide (10 gm. per 100 ml. water), ten minutes' immersion, copper oleate [ibid., xxv, p. 355] (17 gm., five minutes), a mixture of copper naphthenate and copper oleate (12·7 : 4·3 gm., five minutes), mercuric chloride with 8-hydroxyquinoline (1 : 2 gm., 30 minutes), and copper naphthenate (17 gm., five minutes). The temperature of the bath was 25° to 30° C. for all the treatments except the mercuric chloride and 8-hydroxyquinoline, for which it was raised to 100° (90° to 95° for a second period of 15 minutes' immersion). Excellent control of microbial damage, with slight termite infestation, was further afforded by copper sulphate with 8-hydroxyquinoline (1 : 2 gm., 30 minutes in the first bath at 100° and 15 in the second at 90° to 95°), and two natural dye extracts, osage orange [*Toxylon pomiferum*] (5 gm.) and quercitron [*Quercus velutina*] (5 and 10 gm.), both used in conjunction with copper sulphate (1 gm.) and potassium dichromate (0·3 gm.), the immersion periods for all treatments being 16 to 18 hours in the first bath and 30 minutes in the second, both at 100°.

Mildew and rot resistance of textiles and effectiveness of textile fungicides. Tentative method (3rd revision—April 4, 1946).—*Amer. Dyest. Reptr*, xxxv, 11, pp. P 274–276, P 282, 1946.

The general purposes of these methods [*R.A.M.*, xxiv, p. 282] are (1) to determine the behaviour of textiles in respect of mildew, and (2) to evaluate the mildew preventives offered to the trade. Section I contains a description of the actual test procedures regarded as most easily reproducible and widely applicable; II presents suggested methods of application and interpretation of these procedures in testing both the initial mildew resistance of textiles and the permanence of the reaction; and III describes the application of these tests in determining the fungicidal potency of mildew-preventive compounds under uniform conditions and their permanence when applied to a standard fabric.

MacDougal (D. T.) & Dufrénoy (J.). **Criteria of nutritive relations of fungi and seed-plants in mycorrhizae.**—*Plant Physiol.*, xxi, 1, pp. 1–10, 1946.

The authors consider that the nutritive relations of plants anatomically engaged vary by minute gradations from destructive parasitism, through intermediate stages of unbalanced to stabilized symbiosis, to effects purely mechanical and incidental. Moreover, plants set free substances in the soil that may be toxic or beneficial to adjacent species. Terms such as facultative and obligate parasitism and commensalism are, therefore, without precise meaning. A major and a minor feature may be distinguished between two plants which are anatomically engaged, viz., (1) the origination, flow, and ultimate disposal of material, and (2) the alterations in tissue structure, cytological aberrations, and metabolic changes resulting from these processes. It is consequently evident that the nature of the association of two species is ultimately determinable only on cytological and cytochemical evidence, the value of the latter depending on the sequence of metabolic changes being sufficiently fully ascertained and clearly represented.

In orchid and pine mycorrhiza [*R.A.M.*, xxiv, p. 29] the main constituents of the protoplasm may be elaborated by the fungi and transferred to the cortex. The fate of the occupied host cell after translocation is a matter of the balance between agencies which activate hydrogen from such metabolites as sugar, and of those activating atmospheric oxygen, inducing changes in the oxygen which dispose it to accept hydrogen. This process is dependent upon dehydrogenases, comprising compounds of carbon, nitrogen, phosphorus, iron, and sulphur of high molecular weight, such as are represented by active groups of complex structure like sulphhydril (J. R. Routien & R. F. Dawson in *Amer. J. Bot.*, xx, pp. 440–451, 1943). The relationship becomes symbiotic or parasitic according to the nature of the reaction. Normal functioning of the dehydrogenases in aerobic respiration involves the

resumption of their original state by phenolic compounds through re-hydrogenation following the release of hydrogen to oxygen by the dehydrogenases, permitting hyphal ramification to continue; while as a result of the dispersal of the dehydrogenases further oxidation and polymerization of the quinoids into gummy tannin masses is promoted, with fixation of the available proteins; and the tannin formation inhibits further hyphal development. Cytochemical methods of analysis of nutritive relations of mycorrhizal elements are discussed with special reference to vital staining as a method for localizing major cell components and to fixation methods procuring immediate reactions parallel to metabolic reactions ensuing gradually after a decompensated respiration in living cells. The importance is emphasized of phosphorus in the metabolism of mycorrhiza. The well-known molybdenic reagent causes water-soluble phosphorus compounds, such as are released in the dispersion of the hydrogenases, to appear immediately as a blue phosphomolybdenic complex. Phosphorus more tenaciously bound up in the lipo-nucleoproteins is demonstrated several hours later. It is further stated that phosphorylated glycogen, and not glycogen, as suggested earlier in the literature, may be accepted as the source of the carbohydrates in mycorrhiza, taking the form of glucose and starch in the cortex. Attention is drawn to the influence of the plastids on phosphorus metabolism, the amyloplasts, for example, present in the cortex but not in the fungus, synthesizing starch from the phosphorylated carbohydrates derived from the mycorrhizal fungus or transferred from neighbouring elements, while nucleoproteids are developed in proteoplasts both in hyphae and cortex.

Genetic investigations suggested that the minute seeds of terrestrial orchids offer possibilities of constitutional modification which might have their origin in environmental influences, particularly in regard to substances derived from associated fungi entering the embryo at an early stage, special significance attaching to accelerated metabolism and the transfer of foreign nucleoproteids and phosphorus complexes. The principal mutations observed included loss of roots, reduction or total loss of photosynthetic mechanisms, and the acquisition of a capacity to mature seeds in the absence of photosynthesis.

Sappa (F.). **Ricerche biologiche sul Tuber magnatum Pico. La germinazione delle spore e carratteri della micorriza.** [Biological researches on *Tuber magnatum* Pico. The germination of the spores and the characters of the mycorrhiza.]—*Nuovo G. bot. ital.*, N.S., xlvii, 1, pp. 155–198, 1 pl. (facing p. 246), 1 fig., 1940. [Received July, 1946.]

In a study of the biology of the truffle, *Tuber magnatum* [*R.A.M.*, xii, p. 485], the author obtained clear evidence of spore germination, not hitherto recorded for this fungus. When oak seedlings were placed in pots after the roots had been sprinkled with the powdered fungus and sand and the plants were kept in a greenhouse and then placed outdoors in a shady place, the pots being kept above soil-level and watered during the dry months, a mycorrhiza developed which enveloped the rootlets, and was of the ectoendotrophic type, with well-marked ectotrophism. Penetration of the hyphae in the intercellular parts of the cortical layers was observed. The hyphae were mostly 2·5 to 3 μ in diameter and were septate, forming a compact layer round the root. These hyphae showed no clamp-connexions and differed in this and other respects from those described by Mattirolo in 1887. Further work is in progress.

Roberts (Catherine). **The effect of iron and other factors on the production of pigment by the yeast Torulopsis pulcherrima.**—*Amer. J. Bot.*, xxxiii, 4, pp. 237–244, 12 figs., 1946.

Studies are presented on the effects of the amount of nutrient substance, light, temperature, oxygen, iron concentration, and acidity of the medium on the varia-

tion in pigmentation of 10 single-cell isolates of *Torulopsis pulcherrima* [cf. *R.A.M.*, xxv, p. 235].

HAWKER (L[ILIAN] E.) & CHAUDHURI (S. D.). **Growth and fruiting of certain Ascomycetous fungi as influenced by the nature and concentration of carbohydrate in the medium.**—*Ann. Bot., Lond.*, N.S., x, 38, pp. 185–194, 1 graph, 1946.

The effects of a range of concentrations from 0·5 to 10 per cent. of glucose, fructose, sucrose, maltose, starch, and lactose on the growth and fructification of *Podospora* sp., *Sordaria fimicola*, *Chaetomium cochliodes*, *Melanospora zamiae*, *Ceratostomella adiposa*, and *Pyronema confluens* were investigated by experimental methods generally similar to those described in previous papers dealing with *M. destruens* [*R.A.M.*, xvi, p. 199] (and *Ann. Bot., Lond.*, 1, pp. 325–344, 1936; ibid., N.S., iii, pp. 455–468, 1939). The fungi responded uniformly to glucose and fructose, i.e., mycelial growth increased parallel with rises in the sugar concentration up to the maximum, whereas fruiting reached a maximum at a low concentration, varying with the individual species, and then declined rapidly. Reactions to the more complex carbohydrates were of three types, namely, (1) similar to those observed in the case of the above-mentioned hexoses, (2) starvation growth at low concentrations and a slight increase in both growth and fruiting at higher concentrations, and (3) an intermediate response expressed by poor growth and sporulation at low concentrations, both improving steadily with increased carbohydrate supplies. In three of the organisms studied, viz., *Podospora* sp., *Chaetomium cochliodes*, and *Pyronema confluens*, the types of response to sucrose were correlated with the rate of inversion of the sugar and the quantity of invertase produced per unit weight of mycelium. Thus, on the 11th day after inoculation *P. confluens* had utilized practically all the sugar and the dry weight of its mycelium was 900 mg. per 100 c.c. medium, the corresponding figures for *C. cochliodes* being all but 0·66 per cent. sugar and 780 mg. mycelium and for *Podospora* sp. 1·67 per cent. and 115 mg., respectively. These differences in response may be partially, though not wholly, explicable by variations in the rate at which the individual species can break down complex carbohydrates to hexose.

MARSH (P. B.) & BOLLENBACHER (KATHARINA). **The vitamin requirements of Memnoniella and Stachybotrys.**—*Amer. J. Bot.*, xxxiii, 4, pp. 245–249, 3 figs., 1946.

Experiments to determine the vitamin requirements of six isolates of the cellulose-decomposing fungus, *Memnoniella*, and five of the related genus, *Stachybotrys* [*R.A.M.*, xxv, p. 367], showed all to require very small amounts of biotin for their growth, which was not influenced by 15 other vitamins used. A medium containing mineral salts, agar, and brown sugar also, yeast extract and maizemeal agar media, all of which contain natural biotin, proved satisfactory for growth and sporulation. Both fungi grew freely on unbleached cotton duck, thus denoting the presence of biotin in the fabric.

KÖHLER (E.) & PAUKŠENS (J.). **Solanum demissum L. als Testpflanze verschiedener Mosaikviren.** [*Solanum demissum* L. as an indicator plant for various mosaic viruses.]—*Züchter*, xvi, 1–3, pp. 8–11, 1 fig., 1944.

A lengthy search for an indicator plant in the differential diagnosis of potato virus A [*R.A.M.*, xxi, pp. 218, 469; xxv, p. 322] has culminated in the discovery of *Solanum demissum*, on which the virus induces highly distinctive symptoms. Primary infection on the mechanically inoculated leaves is expressed by blackish-brown, roughly circular, necrotic spots, sometimes accompanied by vein-stippling;

the secondary symptom of transient vein-clearing on the upper leaves is not invariably present. The only other viruses causing a similar type of infection are those of the tobacco-mosaic virus group, which are of no practical importance in potato cultivation. The symptoms induced on *S. demissum* by potato viruses X, Y, K [? potato leaf-rolling mosaic virus], potato aucuba mosaic virus, and tobacco ring-spot virus are described.

ARK (P. A.). **Some laboratory and field data on ring-rot of Potatoes in California.**—*Amer. Potato J.*, xxiii, 4, pp. 170–180, 1946.

An intensive study of potato bacterial ring rot (*Phytomonas sepedonica*) [*Corynebacterium sepedonicum*: *R.A.M.*, xxv, p. 181] in California showed that the ooze test [ibid., xxv, p. 277] is of value as a preliminary to other confirmatory tests, such as gram-staining and inoculations. If the disease is known to have been present in the seed stock, and it is desired to clean up the stock as quickly as possible recourse can also be had to the incubation test. Short pieces cut off the stem end are placed in peat-moss and incubated at 28° C. for three weeks, when affected tubers will show symptoms of the condition. The clean ones alone are then used for propagation.

Disinfection studies showed that in disinfecting a contaminated cutting-knife it should, before dipping in the disinfectant, be wiped to ensure the removal of slime and tissue debris that might protect the bacteria from contact with the disinfectant. Bacterial slime was found to exert a marked influence on the effectiveness of various disinfectants, dreft (sodium lauryl sulphanate) [ibid., xxiii, p. 300], to cite one example, which is toxic to pure cultures of *C. sepedonicum* in nutrient broth at a concentration of 0·5 per cent., being rendered ineffective in the presence of untreated slime at one of 2·5 per cent.

In its early stages ring rot has no soft-rot phase. A light, creamy discoloration in and near the turgid tissues of the vascular ring of the stem end is, however, present, and when the diseased tissues become mealy, cracks develop at the apical end, and secondary organisms enter. After this, the amount of soft rot in a field increases. Experiments showed that soft rot can easily be induced in ring-rot potatoes by *Erwinia carotovora*, *E. phytophthora*, and *Pseudomonas fluorescens*, whereas on healthy tubers these organisms produced only insignificant decay. It is thought, therefore, that the soft-rot group of bacteria are primarily wound-followers devoid of invasive capacity. Ring rot-infected hills with soft-rot complications were observed much resembling blackleg and *E. phytophthora* was isolated from both tubers and haulms. Under Californian conditions, blackleg of potatoes can be due to a complex of *E. carotovora*, *E. phytophthora*, or *P. fluorescens* following some strong pathogen, such as *C. sepedonicum*.

DAVIDSON (R. S.). **Ring-rot-like symptoms produced by soft-rot bacteria in Potato tubers.**—*Phytopathology*, xxxvi, 3, pp. 237–239, 1 fig., 1 diag., 1946.

Symptoms resembling those of bacterial ring rot (*Corynebacterium sepedonicum*) developed in potato tubers in Minnesota after heavy flooding at harvest time in 1944. Gram-negative bacteria of the soft rot (*Erwinia carotovora*) group were isolated from Cobbler and Bliss Triumph tubers stored for seven months, and from immature ones of the latter variety from Texas, after varying periods of experimental submersion in water held at constant temperatures. Vascular ring decay was found in Cobblers after 47 hours at 33° C., after 56 at 27°, after 72 at 24°, after 80 at 21°, and after 118 at 18°, while tubers submerged at 33° for 72 hours and at 27° for 118 were completely decayed. The Triumphs reacted similarly but were rather more susceptible. These observations indicate that the soft rot

bacteria may induce a condition simulating the ring rot due to *C. sepedonicum* under the conditions described.

BENNETT (F. T.). **Soft rot of Potatoes in 1945 crops.**—*J. Minist. Agric.*, liii, 2, pp. 56–58, 1946.

A widespread epidemic of soft rot in potatoes in the north of England, first observed in consignments of Scottish seed, and later found affecting English stored crops, most commonly and severely attacked Arran Pilot, Eclipse, Catriona, Arran Banner, and King Edward potatoes among 20 varieties affected. It was attributed as a result of laboratory investigations to incomplete or curtailed maturation due to the peculiar weather conditions of the autumn of 1945. From the slimy white rot characteristic of this infection, a soft-rotting organism of the *B*[*acterium*] *carotovorum* [*Erwinia carotovora*] type was isolated. Inoculations with pure cultures were not carried out but slices of diseased material applied to lesions on sound tubers arising from scabs, mechanical damage, and artificial wounds and incisions showed that infection was associated only with immature tubers, the earlier the lifting the greater the liability to attack. Lack of air, high temperature, moist atmosphere, and pressure favoured spread, and these conditions occurred in railway wagons, large storage heaps, and clamps made in wet weather or earthed too quickly, the disease having been contracted in the soil or soon after lifting.

The rot did not appear to affect sprouting. Sound tubers, selected from consignments or clamps, may be used satisfactorily for seed purposes provided that maturation has been completed. The killing of haulms by spraying, followed by the period required for the maturing of the tubers in the soil, will reduce blight [*Phytophthora infestans*] which predisposes the tubers to soft rot.

EDDINS (A. H.) & WEST (E.). **Sclerotium rot of Potato seed pieces.**—*Phytopathology*, xxxvi, 3, pp. 239–240, 1 fig., 1946.

The seed pieces of Sebago potatoes planted in very dry soil in a field near Hastings, Florida, after the removal of the winter cabbage crop, were attacked by *Sclerotium rolfsii* (in the vegetative stage only) in March, 1945. The seed germinated poorly and the tips of most of the sprouts shrivelled, died, and turned brown on emergence. About four out of every ten seed pieces examined a month after planting were affected, the white mycelium of the fungus being found in decayed holes. Rapid growth was made in a moist chamber, typical sclerotia of *S. rolfsii* being formed on one piece in five days. Inoculation tests on seed pieces in wet and dry soil resulted in complete destruction in the watered pots and small decayed areas in the unwatered. The mycelium of the fungus was present on the pieces removed from wet soil, one of which bore abundant sclerotia after a week in a moist chamber. Mycelium and sclerotia were also found in the soil and on inoculated pieces left in dry soil for a fortnight.

This is believed to be the first report of the spontaneous occurrence of *S. rolfsii* on seed pieces in the field, though the fungus is known as an agent of tuber rot throughout the southern States [*R.A.M.*, ii, p. 387; xxii, p. 494].

HEUBERGER (J. W.) & STEARNS (L. A.). **Compatibility of DDT and fungicides on Potatoes.**—*J. econ. Ent.*, xxxix, 2, pp. 267–268, 1946.

In trials at the Delaware Agricultural Experiment Station in 1944 and 1945, DDT [dichloro-diphenyl-trichloroethane] caused no injury to potato plants when applied against leafhoppers (*Empoasca fabae*), in conjunction with Bordeaux, compound A, zinc dimethyl dithiocarbamate (zerlate) [see above, p. 397], or disodium ethylene bisdithiocarbamate (dithane)+zinc sulphate-lime for the control of early blight (*Alternaria solani*), nor did it reduce the toxicity of the

fungicides to the pathogen. The plants receiving DDT, either alone or combined with a fungicide, were taller and broader, with larger leaflets, than those from which the insecticide was withheld.

SCHAAL (L. A.). **Seed and soil treatment for the control of Potato scab.**—*Amer. Potato J.*, xxiii, 4, pp. 163–170, 1946.

Experiments on the control of potato scab (*Actinomyces scabies*) [*R.A.M.*, xxv, p. 78] carried out in infected alkaline soil (an irrigated, fine sandy loam, of P_H 7·6) in northern Colorado on the Bliss Triumph variety are described.

Treatment of infected 'seed' with mercuric chloride 1 in 1,000 for 1½ hours significantly reduced the number of affected tubers but gave no corresponding decrease in the area scabbed. Soil treatments with mercuric chloride, sulphamic acid, sulphur, aluminium sulphate, and potassium iodide all failed to control infection.

DARPOUX (H.). **Contribution à l'étude des maladies des plantes oléagineuses en France.** [A contribution to the study of the diseases of oleaginous plants in France.]—*Ann. Épiphyt.*, N.S., xi, 1–2, pp. 71–103, 31 figs., 1945.

An account is given of studies carried out in 1943–4 on diseases of oleaginous plants grown experimentally at Versailles. *Peronospora parasitica* was found on colza (*Brassica napus oleifera*), turnip, *Camelina sativa*, and white mustard (*Sinapis* [*B.*] *alba*). *B. rapa* var. *oleifera*, *B. rapa* var. *biennis*, colza, *C. sativa*, and black mustard (*S.* [*B.*] *nigra*) were severely attacked by *Oidium*, presumably *Erysiphe polygoni*, the conidial measurements on colza being 25 to 38 by 14 to 18 μ, and on *B. rapa* var. *oleifera* 26 to 40 by 11 to 17 μ. *B. rapa* and less frequently *C. sativa* showed infection by *Cystopus candidus* [*R.A.M.*, xxii, p. 53]. Turnip, colza, and *B. nigra* were affected by *Alternaria brassicae*; control was obtained by Bordeaux (1 in 100). Poppies (*Papaver somniferum* var. *nigrum*) were seriously attacked by *Pleospora papaveracea* [ibid., xvii, p. 655], a new record for France, by *Peronospora arborescens* [ibid., xxii, p. 112 and next abstract] slightly, and by *Oidium*, presumably *E. cichoracearum*, the conidia measuring 23 to 31 by 12 to 15 μ. Seed disinfection is recommended. Soy-beans were slightly attacked by an *Ascochyta* near to *A. pisi*, the spherical pycnidia of which showed a peridium 10 μ thick, measured about 150 μ in diameter, and contained numerous hyaline stylospores with a transverse septum and measuring 7 to 9 by 2 to 3 μ. Sunflowers were affected by *Puccinia helianthi* [ibid., xxii, p. 111], *Sphaerotheca* sp. (close to *S. fuliginea* [var. *humuli*]) and *Botrytis* sp. *Carthamus tinctorius* was badly attacked by *Puccinia carthami* [ibid., xxiii, p. 40] and by an *Oidium*, probably *E. cichoracearum* f. *carthami*, with conidia measuring 28 to 34 by 15 to 17 μ. A long rotation and seed disinfection are suggested as protective measures against rust.

A serious disease, apparently not before described, was found on *Lallemantia iberica*, an oleaginous plant originating in the Caucasus but also cultivated in Yugoslavia, Persia, America, and since 1942 in Germany. Infection appeared about 15th July, 1944, and rapidly killed off a high proportion of the plants. Brown spots 3 to 4 mm. in diameter, enlarging to 1·5 cm., showing concentric, alternately light and dark areas, developed on all the aerial parts, especially the leaves; when numerous they become confluent and caused partial or complete withering of the plant. The spores, borne on brown, 2- to 5-septate conidiophores measuring 56 to 84 by 5 to 6 μ, were dark chestnut, with 9 to 12 transverse and 0 to 7 longitudinal septa; they measured 72 to 90 by 14 to 19 μ, and had a 4- to 5-septate, hyaline appendage which measured 117 to 156 by 2 μ. The fungus, which appears to be an *Alternaria*, overwintered on diseased plant debris. Numerous conidia were found at the end of January on the seed calices. Perithecia of a *Pleospora* closely resembling *P. herbarum* developed during the winter on pieces of stem debris.